2003 STEERING

Steering Linkage (Non-Rack & Pinion) - Blazer, S10, Jimmy & Sonoma

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	Specification	
	Metric	English
Adjuster Tube Clamp Bolts	21 N·m	16 lb ft
Front Differential Carrier Shield Bolts	25 N·m	19 lb ft
Idler Arm Mounting Bolts and Nuts	108 N·m	79 lb ft
Idler Arm to Relay Rod Nut (RWD)	47 N·m	35 lb ft
Idler Arm to Relay Rod Nut (4WD)	82 N·m	60 lb ft
Inner Tie Rod to Relay Rod Nut	47 N·m	35 lb ft
Outer Tie Rod to Steering Knuckle Nut	53 N·m	39 lb ft
Pitman Arm to Relay Rod Nut (RWD)	48 N·m	36 lb ft
Pitman Arm to Relay Rod Nut (4WD)	83 N·m	61 lb ft
Pitman Arm to Steering Gear Nut	250 N·m	185 lb ft
Steering Linkage Shield Bolts	32 N·m	24 lb ft
Steering Shock Absorber to Front Crossmember Bracket Bolt (4WD)	60 N·m	44 lb ft
Steering Shock Absorber to Relay Rod Nut (4WD)	63 N·m	46 lb ft

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Fig. 1: Fastener Tightening Specification
Courtesy of GENERAL MOTORS CORP.

REPAIR INSTRUCTIONS

STEERING LINKAGE SHIELD REPLACEMENT

Removal Procedure

1. Raise and suitably support the vehicle with safety stands. Refer to **LIFTING AND JACKING THE VEHICLE** in General Information.
2. Remove the steering linkage shield bolts and the washers.
3. Remove the steering linkage shield.

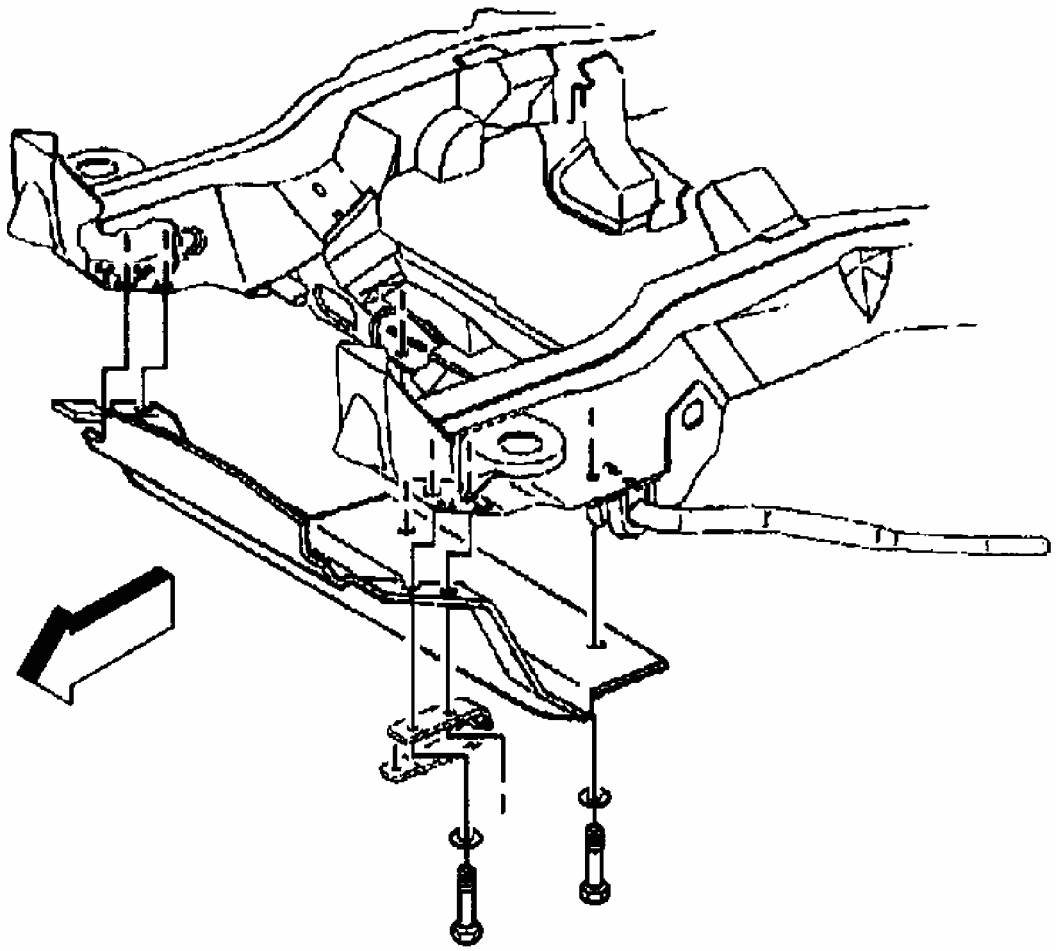

Fig. 2: Steering Linkage Shield Bolts & Washers
Courtesy of GENERAL MOTORS CORP.

Installation Procedure

1. Install the steering linkage shield.

NOTE: Refer to FASTENER NOTICE in Cautions and Notices.

2. Install the steering linkage shield bolts and the washers.

Tighten

Tighten the steering linkage shield bolts to 32 N.m (24 lb ft).

3. Lower the vehicle.

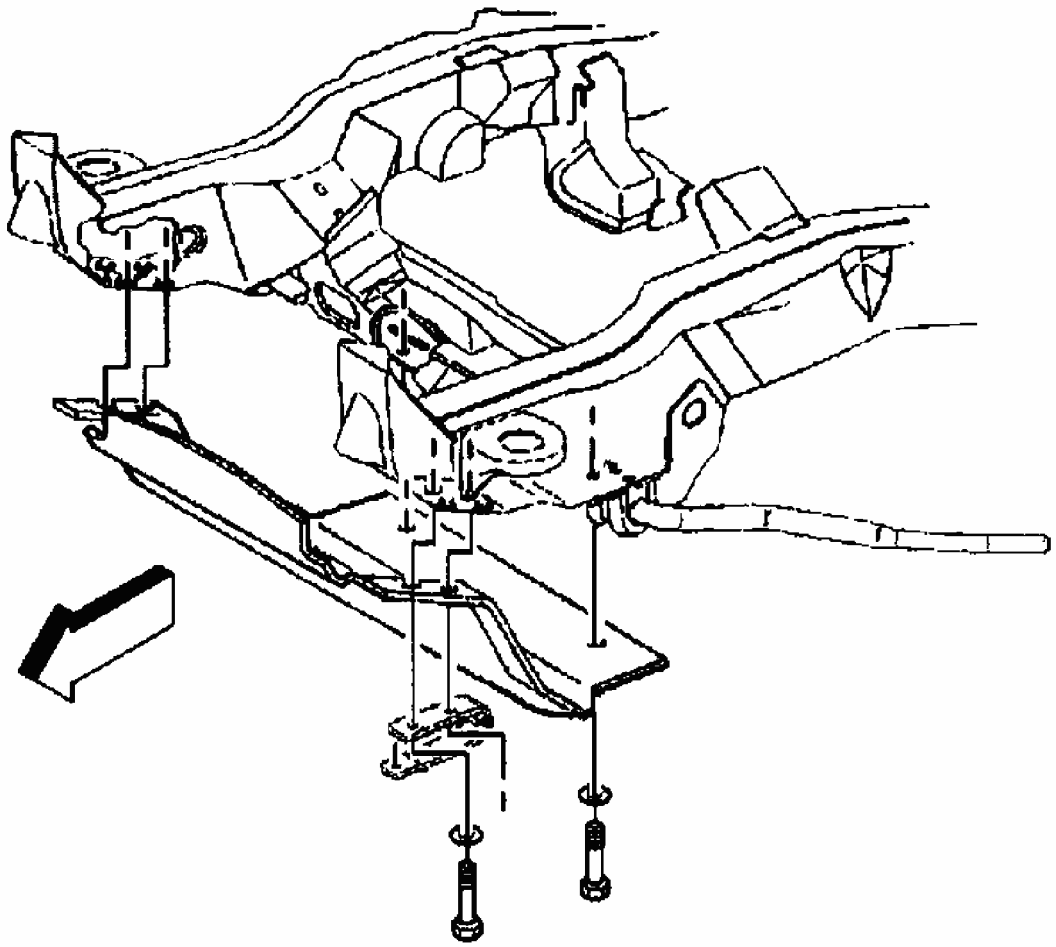

Fig. 3: Steering Linkage Shield Bolts & Washers
Courtesy of GENERAL MOTORS CORP.

STEERING LINKAGE INSPECTION

1. Raise and suitably support the vehicle on safety stands. Refer to **LIFTING AND JACKING THE VEHICLE** in General Information.
2. Turn the ignition switch to the ON position.
3. With the aid of an assistant, move the tire back and forth.
4. Inspect for excessive vertical or lateral movement and/or looseness in the pivot joints.
   - Tie rod ends
   - Idler arm
   - Pitman arm
5. Replace any worn or damaged pivot joints.

TIE ROD REPLACEMENT (RWD)

Tools Required

- *J 6627-A* Tie Rod Puller
- *J24319-B* Steering Linkage and Tie Rod Puller
- *J 29193* Steering Linkage Installer (12 mm)
- *J29194* Steering Linkage Installer (14 mm)

Removal Procedure

1. Raise and suitably support the vehicle with safety stands. Refer to **LIFTING AND JACKING THE VEHICLE** in General Information.
2. Remove the cotter pin from outer tie rod ball stud nut.
3. Remove the outer tie rod ball stud nut.

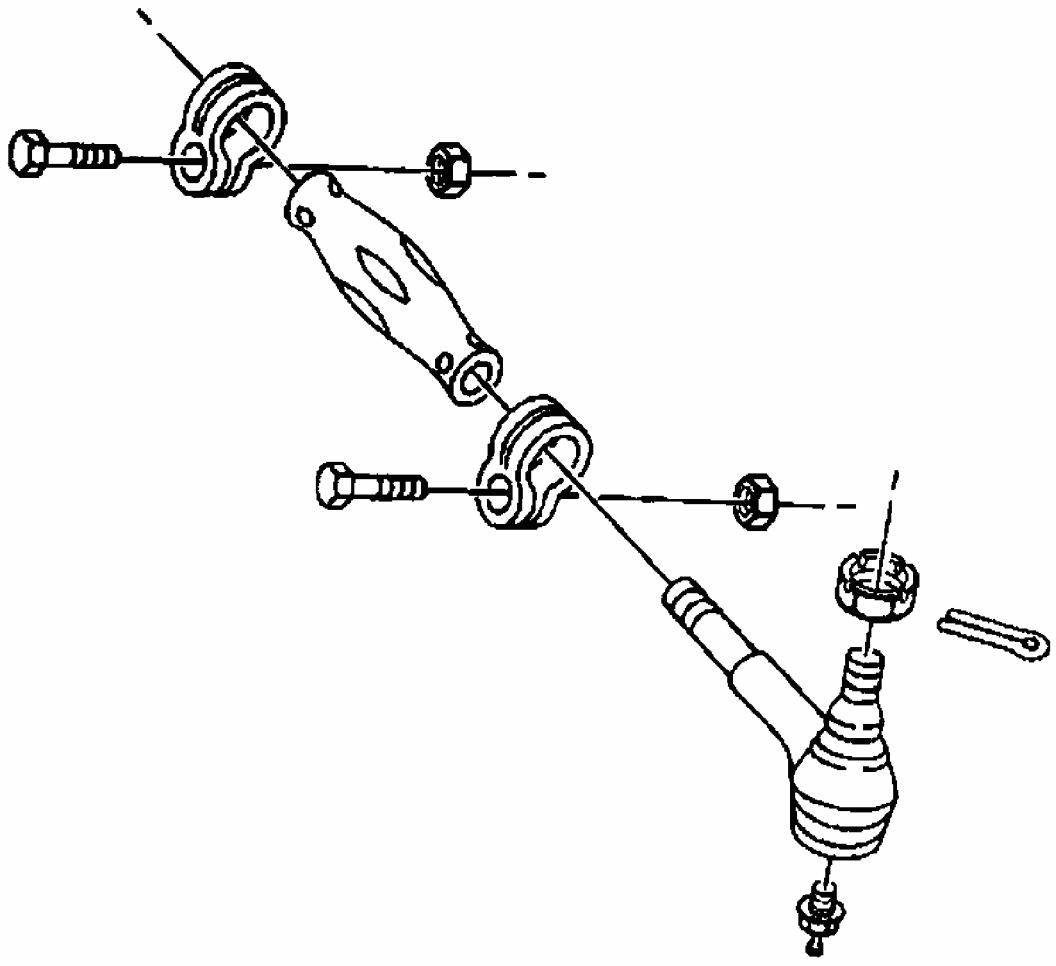

Fig. 4: Removing Cotter Pin From Outer Tie Rod Ball Stud Nut
Courtesy of GENERAL MOTORS CORP.

4. Remove the inner tie rod ball stud nut.

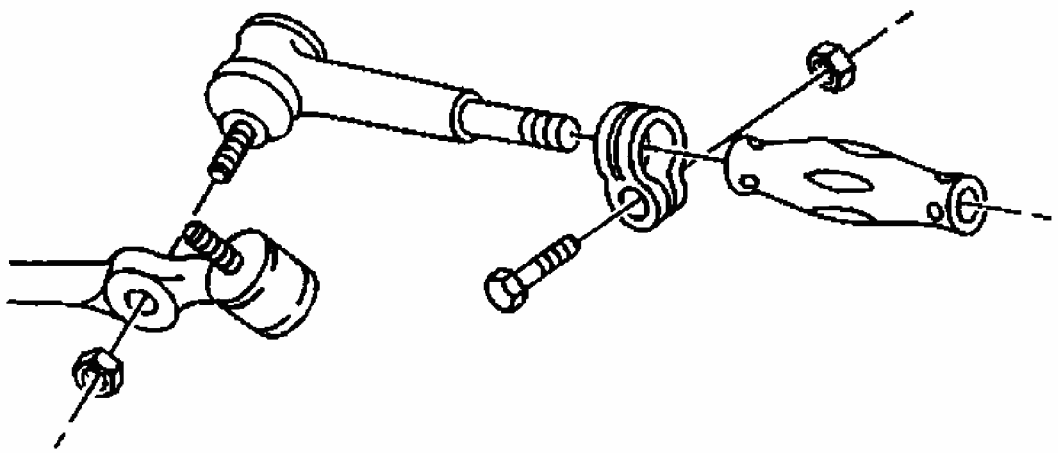

Fig. 5: Inner Tie Rod Ball Stud Nut
Courtesy of GENERAL MOTORS CORP.

NOTE: Do not attempt to disconnect a steering linkage joint by driving a wedge between the joint and the attached part. Seal damage may result which will cause premature failure of the joint.

Important: Use the proper tool in order to separate all tie rods and ball joints.

5. Remove the outer tie rod ball stud from the steering knuckle using *J 24319-B* .

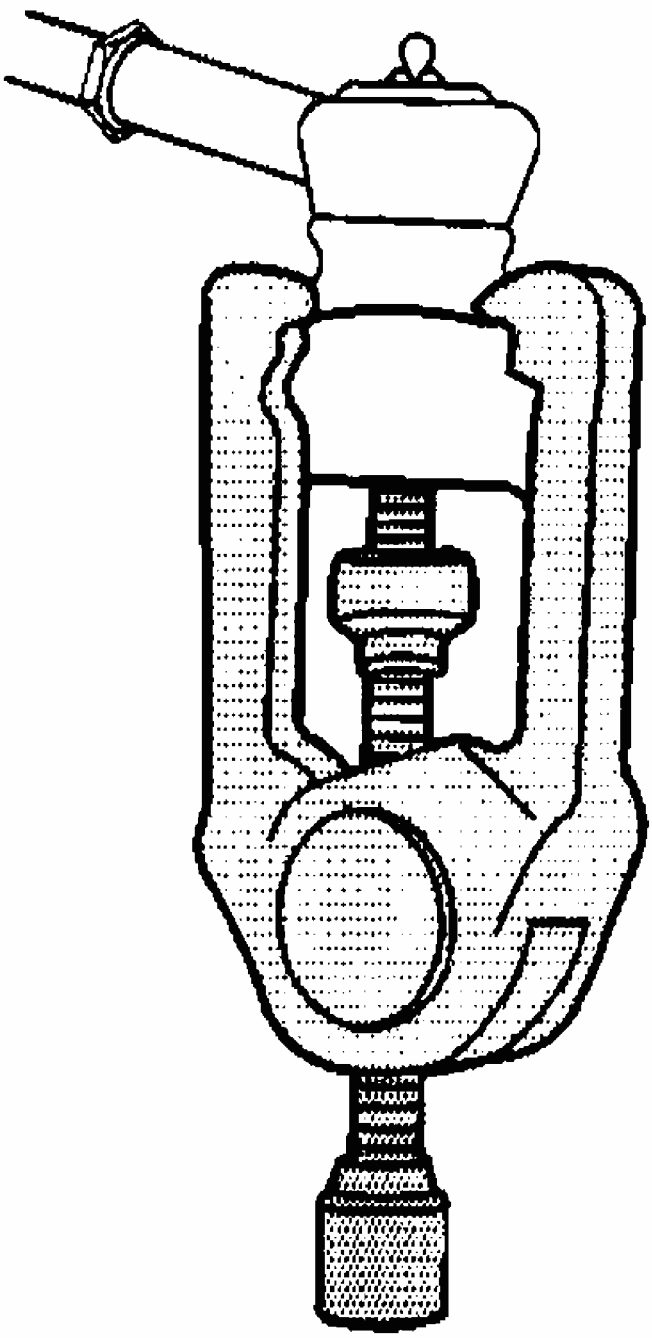

Fig. 6: Removing Outer Tie Rod Ball Stud From Steering Knuckle
Courtesy of GENERAL MOTORS CORP.

6. Remove the inner tie rod ball stud from the relay rod using *J 6627-A* .
7. Perform the following steps in order to remove the tie rod ends from the adjuster tube:
    7.1. Loosen the clamp bolts.

7.2. Unscrew the assemblies.

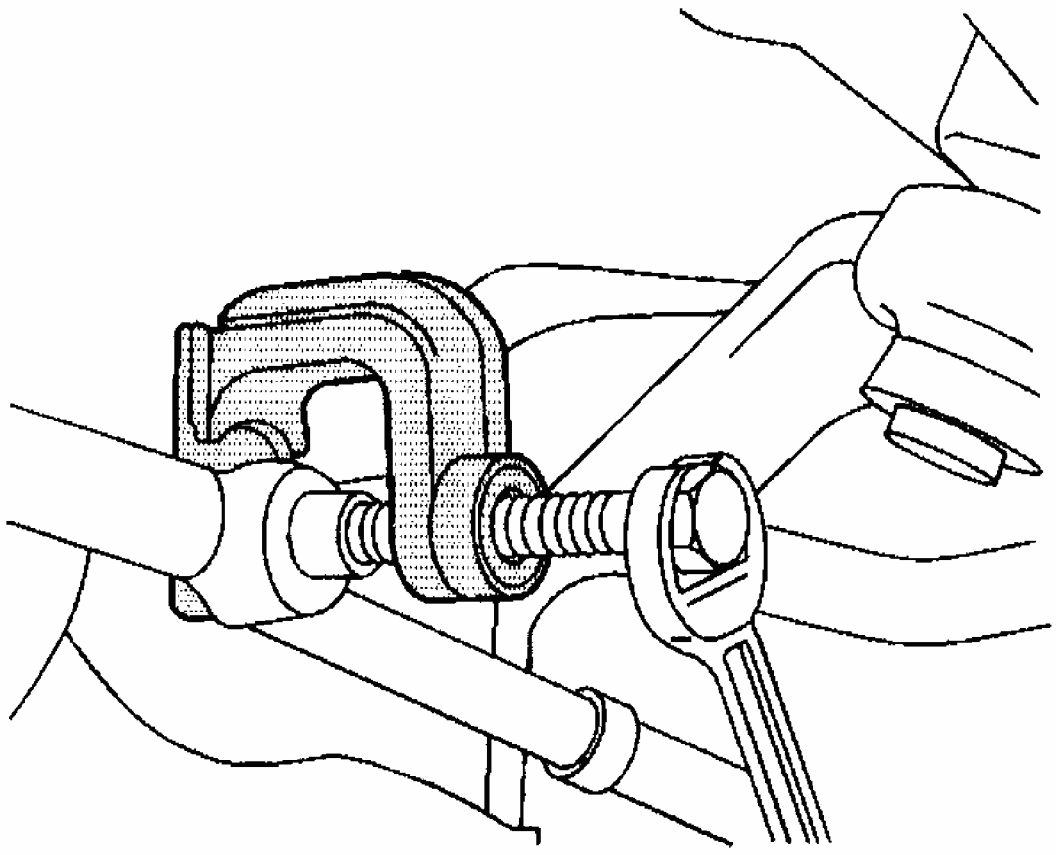

Fig. 7: Removing Inner Tie Rod Ball Stud From Relay Rod
Courtesy of GENERAL MOTORS CORP.

8. Inspect for the following possible conditions:
   - The tie rod ends for damage
   - The tie rod end seals for excessive wear
   - The tie rod threads for damage
   - The tie rod ends for damage
   - The ball stud threads for damage
   - The adjuster tube for bending
   - The adjuster tube for damaged threads
9. Clean the following components:
   - The ball stud threads
   - The ball stud nut

- The tapered surfaces

Installation Procedure

Important: If the tie rod ends were removed, lubricate the tie rod ends with chassis lubricant.

1. Connect the tie rod ends to the adjuster tube.

   Ensure that the number of threads on both the inner and the outer tie rod ends are equal within three threads.

2. Install the inner tie rod ball stud to the relay rod. Ensure that the seal is on the stud.

   NOTE: Refer to FASTENER NOTICE in Cautions and Notices.

3. Seat the taper using *J 29193* or *J 29194* .

   Tighten

   Tighten *J 29193* or *J 29194* to 54 N.m (40 lb ft).

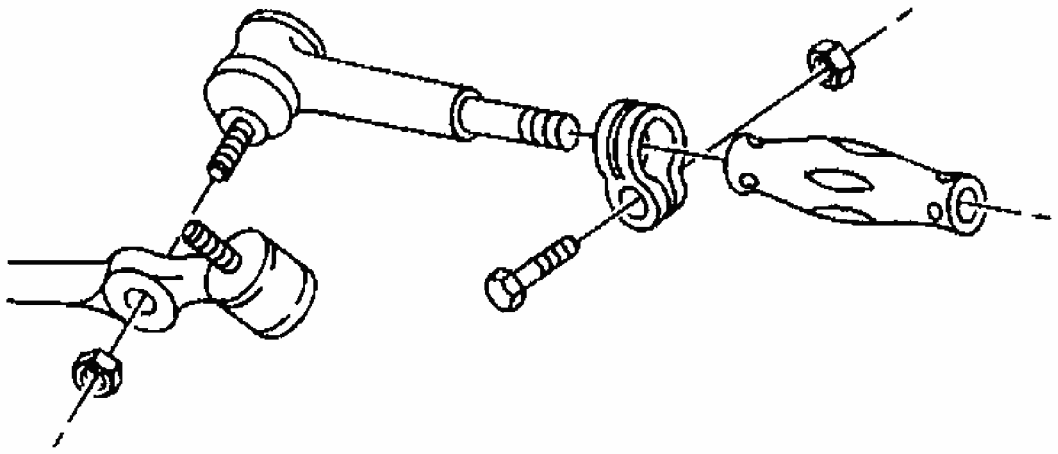

Fig. 8: Installing Inner Tie Rod Ball Stud To Relay Rod
Courtesy of GENERAL MOTORS CORP.

4. Remove *J 29193* or *J 29194* from inner tie rod ball stud.
5. Install the new nut to the inner tie rod ball stud.

Tighten

Tighten the inner tie rod ball stud nut to the relay rod to 47 N.m (35 lb ft).

6. Connect the outer tie rod ball stud to the steering knuckle.

   Ensure that the seal is on the stud.

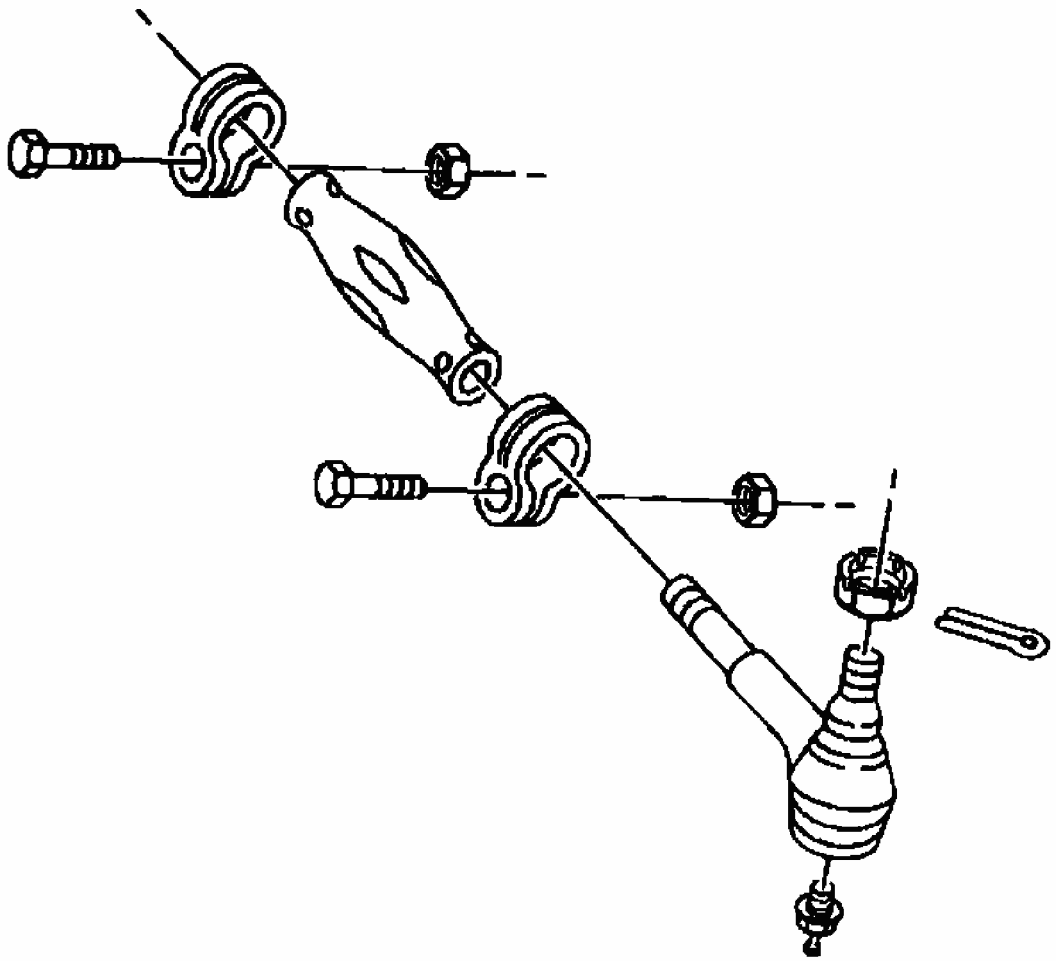

Fig. 9: Connecting Outer Tie Rod Ball Stud To Steering Knuckle
Courtesy of GENERAL MOTORS CORP.

7. Seat the taper using *J 29193* or *J 29194* .

Tighten

Tighten *J 29193* or J29194 to 54 N.m (40 lb ft).

8. Remove *J 29193* or *J 29194* from outer tie rod ball stud.
9. Install the nut to the outer tie rod ball stud.

Tighten

Tighten the outer tie rod ball stud nut to the steering knuckle to 53 N.m (39 lb ft).

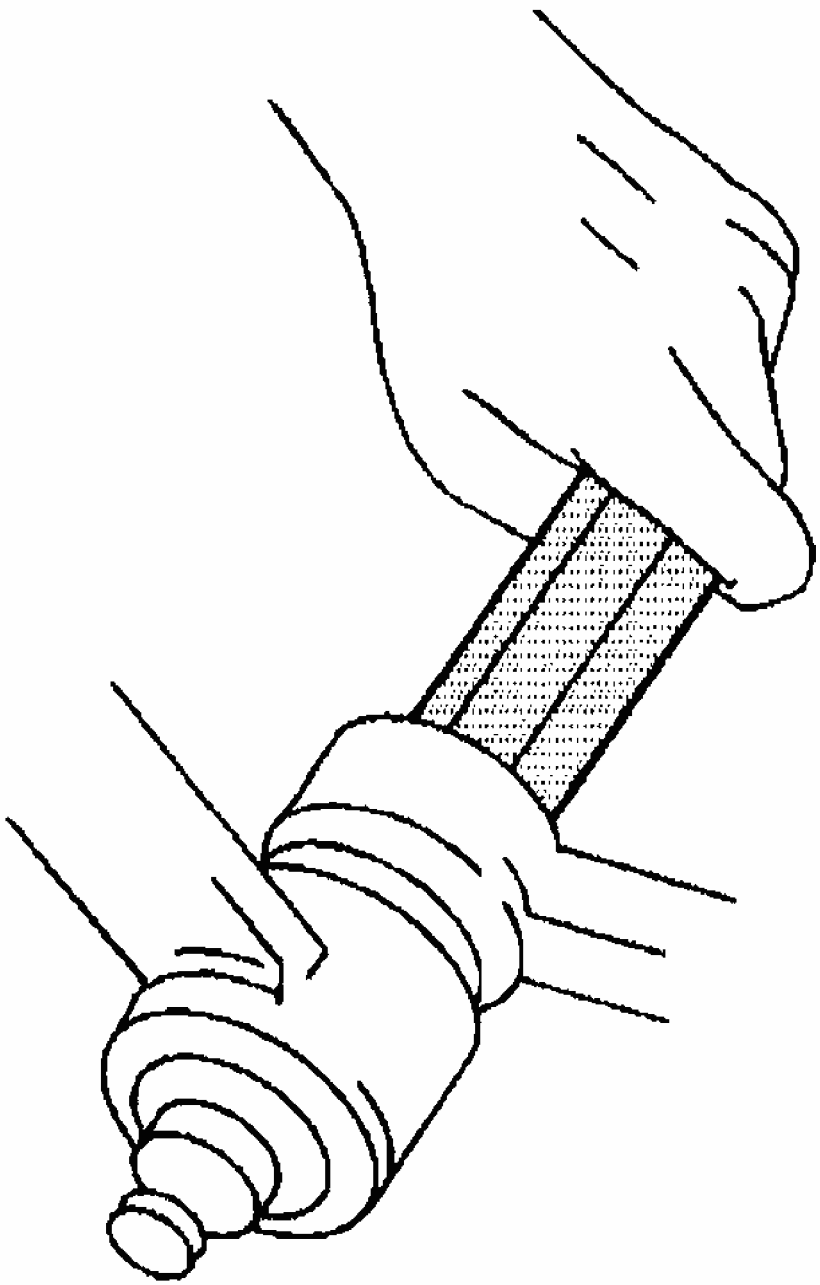

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Fig. 10: Tightening Outer Tie Rod Ball Stud Nut To Steering Knuckle
Courtesy of GENERAL MOTORS CORP.

Important: Do not back the nut off in order to align the cotter pin hole. Advance the nut in order to align the nut slot with the cotter pin hole.

10. Install the new cotter pin to the outer tie rod stud nut.
11. Spread the cotter pin ends.
12. Lower the vehicle.
13. Adjust the front toe. Refer to **FRONT TOE ADJUSTMENT** in Wheel Alignment.
14. Position the two clamps (2) between the locating dimples (1) at either end of the adjuster tube.

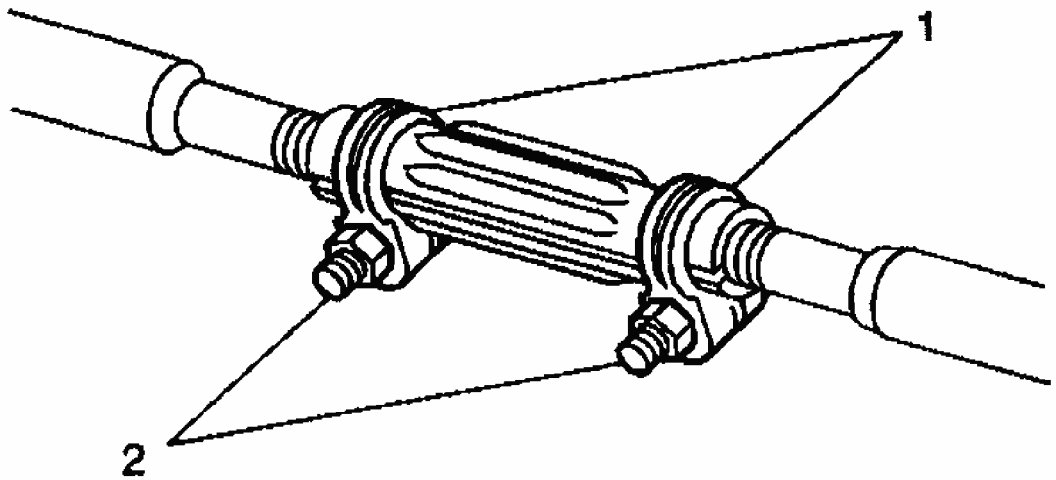

Fig. 11: Positioning Two Clamps Between Locating Dimples At Either End Of Adjuster Tube
Courtesy of GENERAL MOTORS CORP.

15. The clamps must be positioned within the correct angular travel, as shown.
16. Ensure that the clamp slot (2) is not aligned with the adjuster tube slot (1).
17. Maintain the position of each tie rod end as the clamps are tightened in order to ensure free movement of each joint.

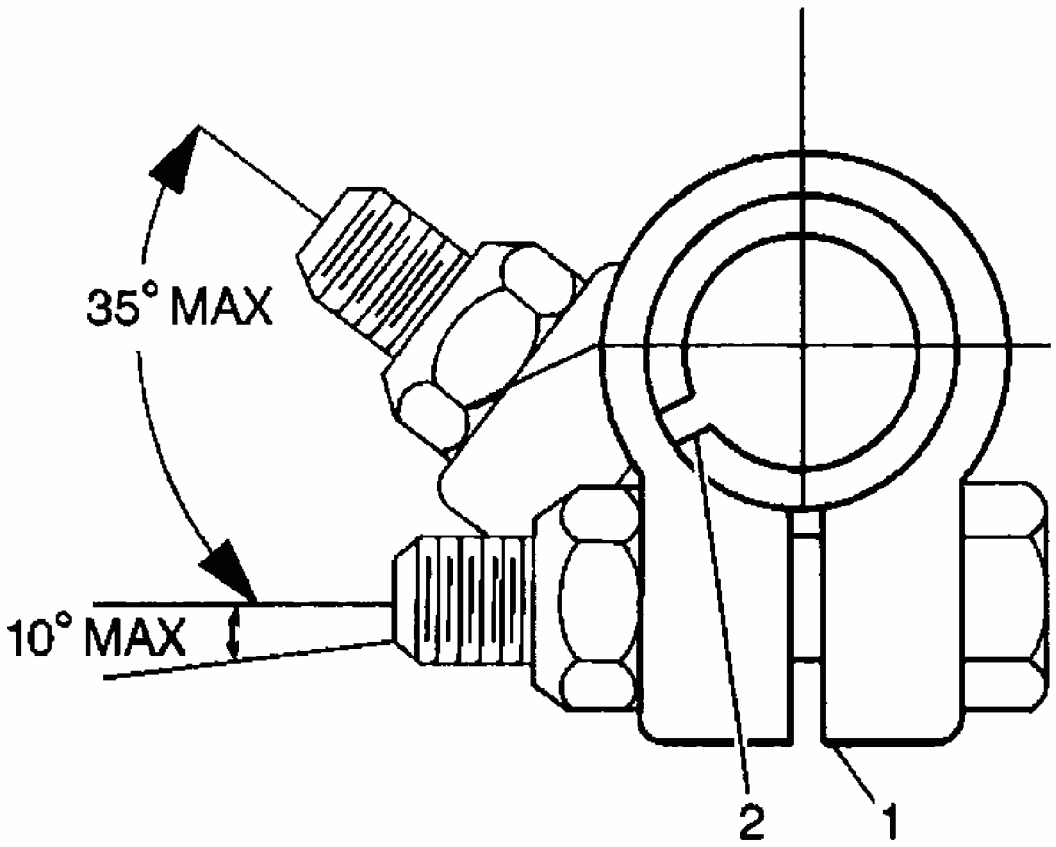

Fig. 12: Identifying Correct Angular Travel Position Of Clamps
Courtesy of GENERAL MOTORS CORP.

18. When clamps are tightened to specifications, the ends may touch.
19. Install the adjuster tube clamp bolts.

Tighten

Tighten the adjuster tube clamp bolts to 21 N.m (16 lb ft).

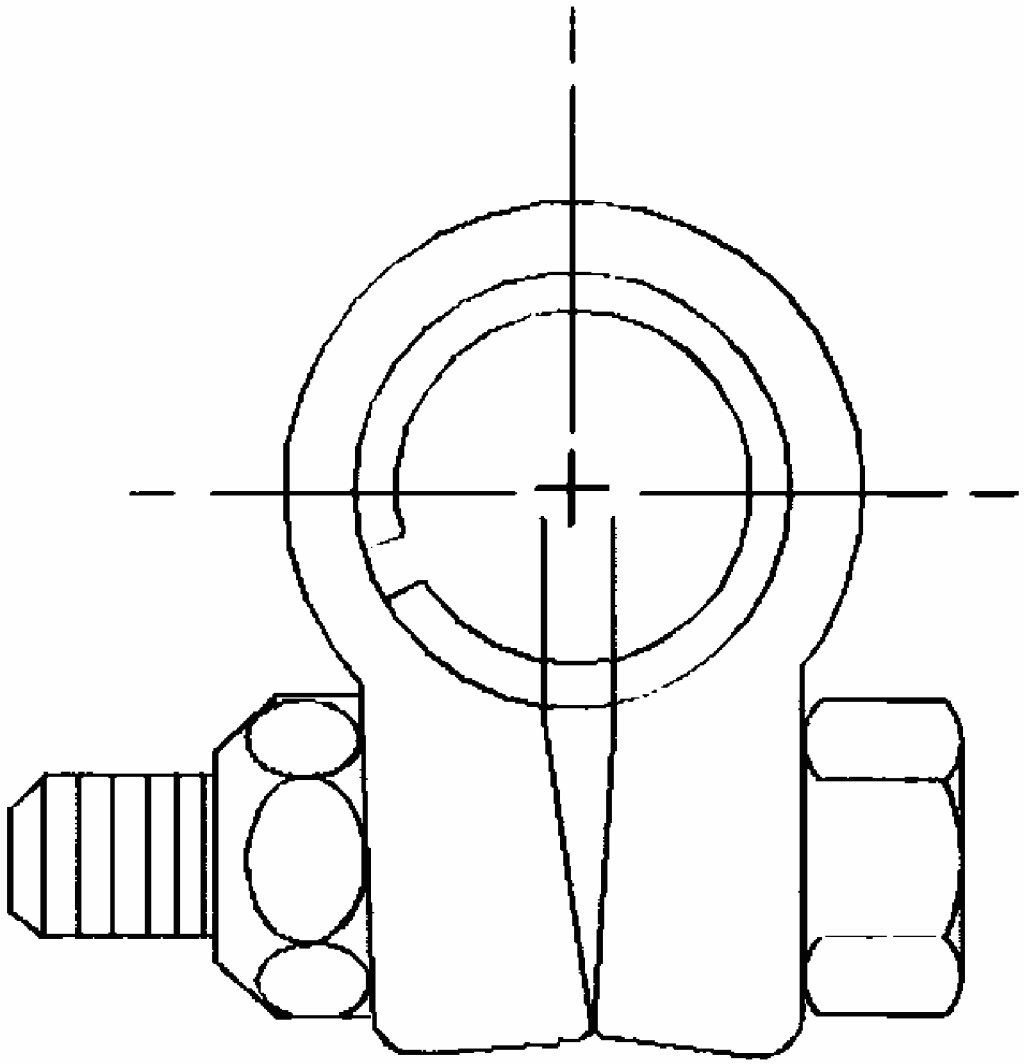

Fig. 13: Identifying Correct Tightening Position Of Adjuster Tube Clamp Bolts
Courtesy of GENERAL MOTORS CORP.

TIE ROD REPLACEMENT (4WD)

Tools Required

- *J 6627-A* Tie Rod Puller
- *J24319-B* Steering Linkage and Tie Rod Puller
- *J 29193* Steering Linkage Installer (12 mm)
- *J 29194* Steering Linkage Installer (14 mm)

Removal Procedure

1. Raise and suitably support the vehicle with safety stands. Refer to **LIFTING AND JACKING THE VEHICLE** in General Information.
2. Remove the cotter pin from outer tie rod ball stud nut.
3. Remove the outer tie rod ball stud nut.

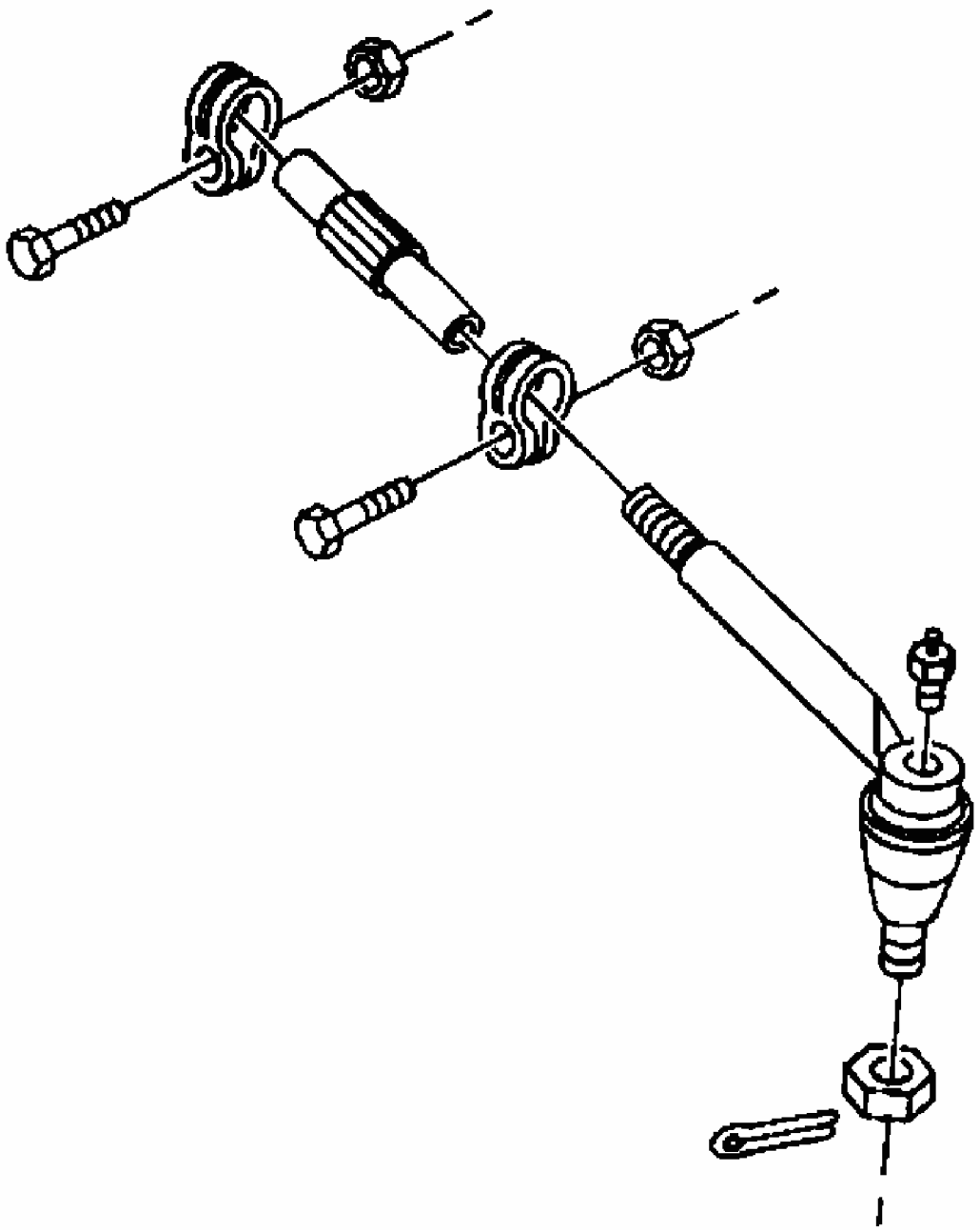

Fig. 14: Removing Cotter Pin From Outer Tie Rod Ball Stud Nut
Courtesy of GENERAL MOTORS CORP.

4. Remove the inner tie rod ball stud nut.

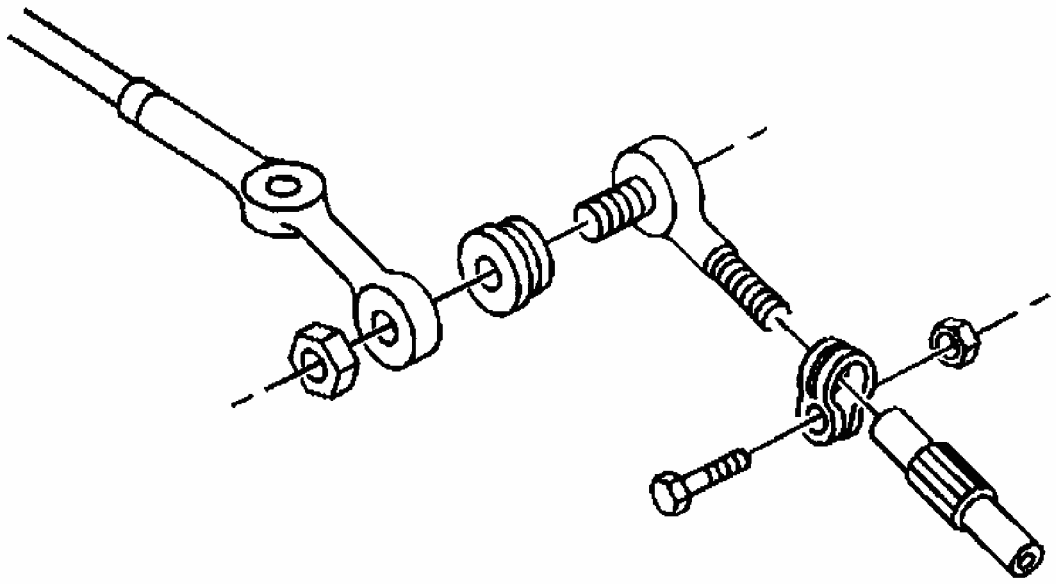

Fig. 15: Inner Tie Rod Ball Stud Nut
Courtesy of GENERAL MOTORS CORP.

NOTE: Do not attempt to disconnect a steering linkage joint by driving a wedge between the joint and the attached part. Seal damage may result which will cause premature failure of the joint.

Important: Use the proper tool in order to separate all tie rods and ball joints.

5. Remove the outer tie rod ball stud from the steering knuckle using *J 24319-B* .

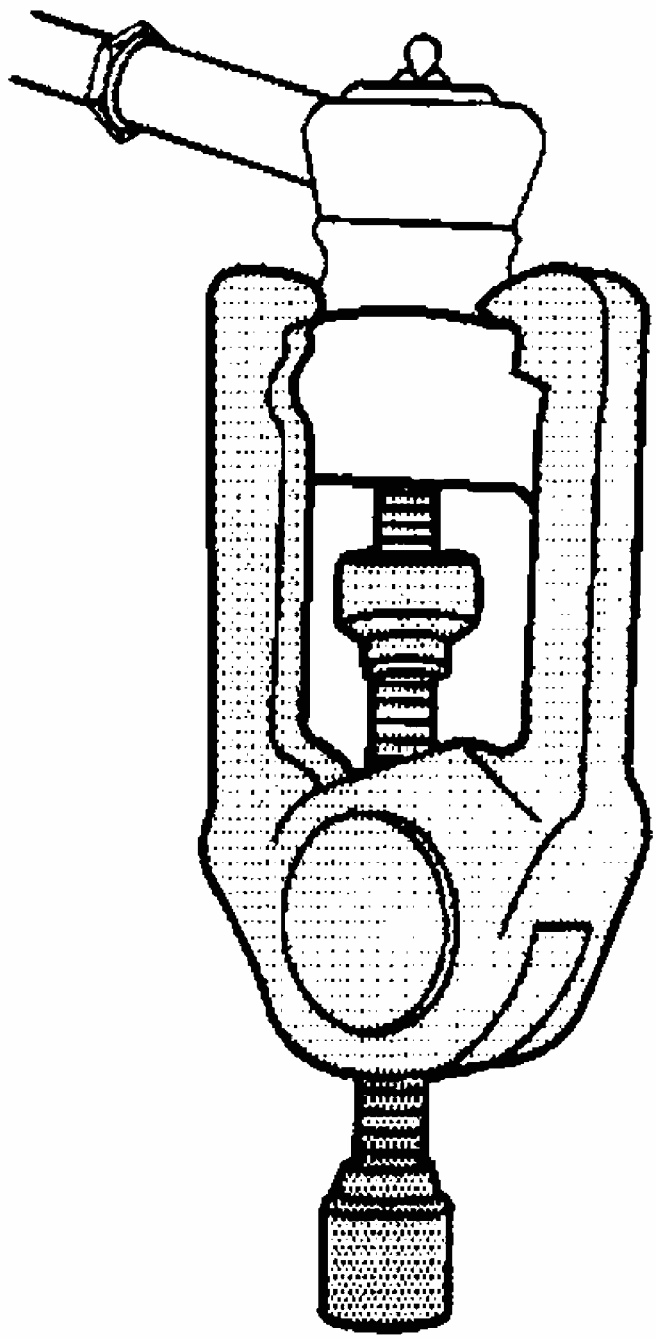

Fig. 16: Removing Outer Tie Rod Ball Stud From Steering Knuckle
Courtesy of GENERAL MOTORS CORP.

6. Remove the inner tie rod ball stud from the relay rod using *J 6627-A*.

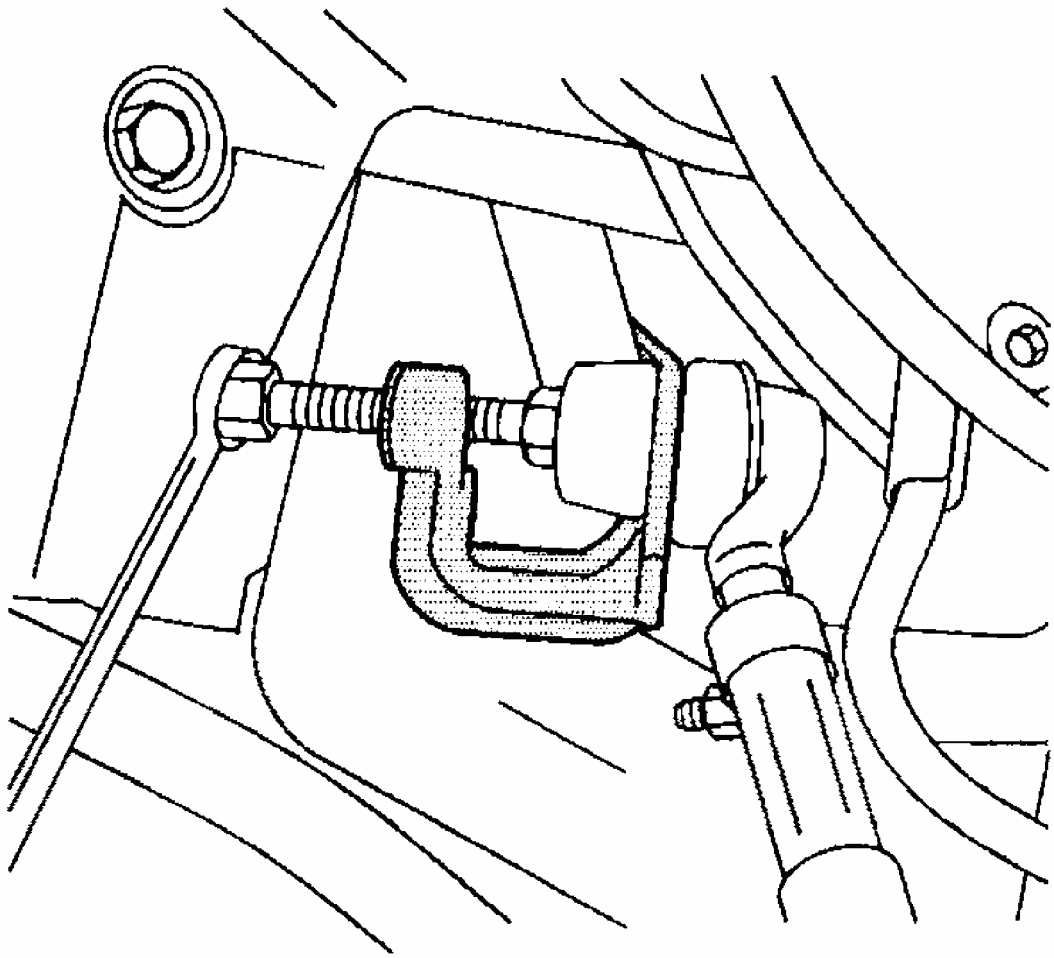

Fig. 17: Removing Inner Tie Rod Ball Stud From Relay Rod
Courtesy of GENERAL MOTORS CORP.

7. Perform the following steps in order to remove the tie rod ends from the adjuster tube:
    7.1. Loosen the clamp bolts.
    7.2. Unscrew the assemblies.

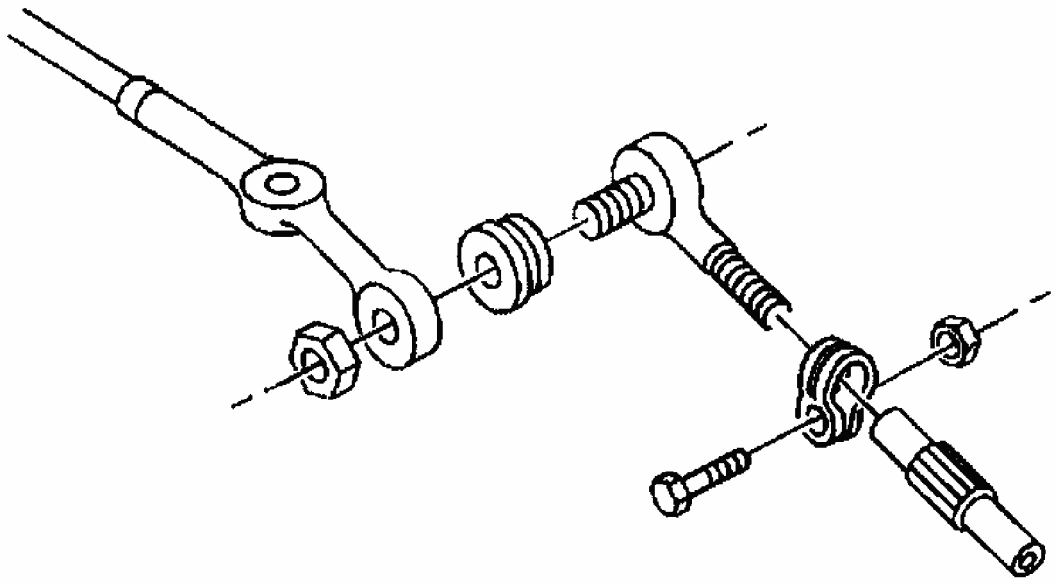

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Fig. 18: Removing Tie Rod Ends From Adjuster Tube
Courtesy of GENERAL MOTORS CORP.

8. Inspect for the following possible conditions:
   - The tie rod ends for damage
   - The tie rod end seals for excessive wear
   - The tie rod threads for damage
   - The tie rod end for damage
   - The ball stud threads for damage
   - The adjuster tube for bending
   - The adjuster tube for damaged threads
9. Clean the following components:
   - The ball stud threads
   - The ball stud nut
   - The tapered surfaces

Installation Procedure

Important:

- If the tie rod ends were removed, lubricate the tie rod ends with chassis lubricant.
- Ensure that the number of threads on both the inner and the outer tie rod ends are equal

within three threads.

1. Connect the tie rod ends to the adjuster tube.
2. Install the inner tie rod ball stud to the relay rod. Ensure that the seal is on the stud.

NOTE: Refer to FASTENER NOTICE in Cautions and Notices.

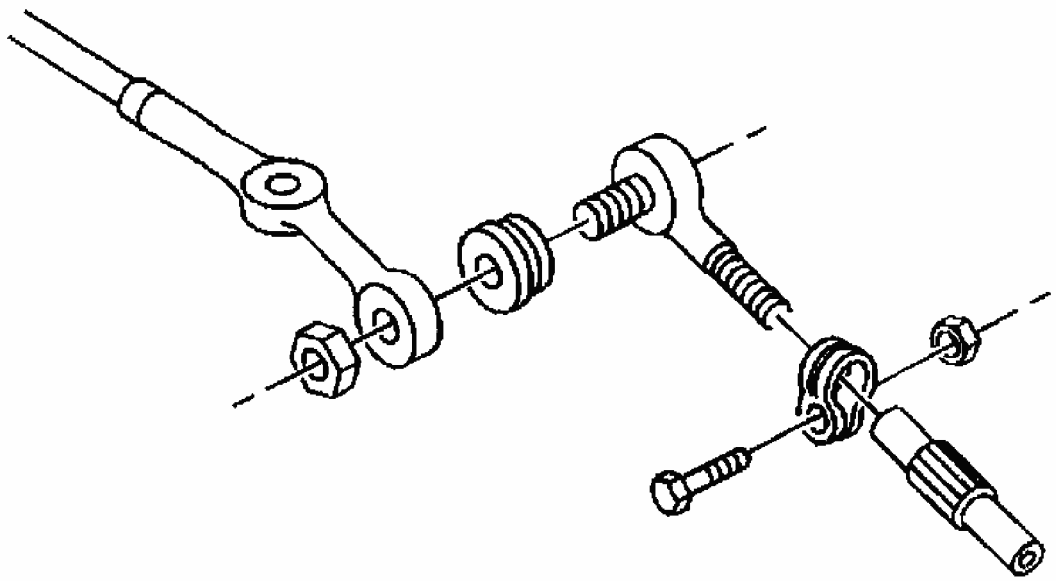

Fig. 19: Installing Tie Rod Ends To Adjuster Tube
Courtesy of GENERAL MOTORS CORP.

3. Seat the taper using *J 29193* or *J 29194*.

Tighten

Tighten *J 29193* or *J 29194* to 54 N.m (40 lb ft).

4. Remove *J 29193* or *J 29194* from the inner tie rod ball stud.
5. Install the new nut to the inner tie rod ball stud.

Tighten

Tighten the inner tie rod ball stud nut to 47 N.m (35 lb ft).

6. Install the outer tie rod ball stud to the steering knuckle.

Ensure that the seal is on the stud.

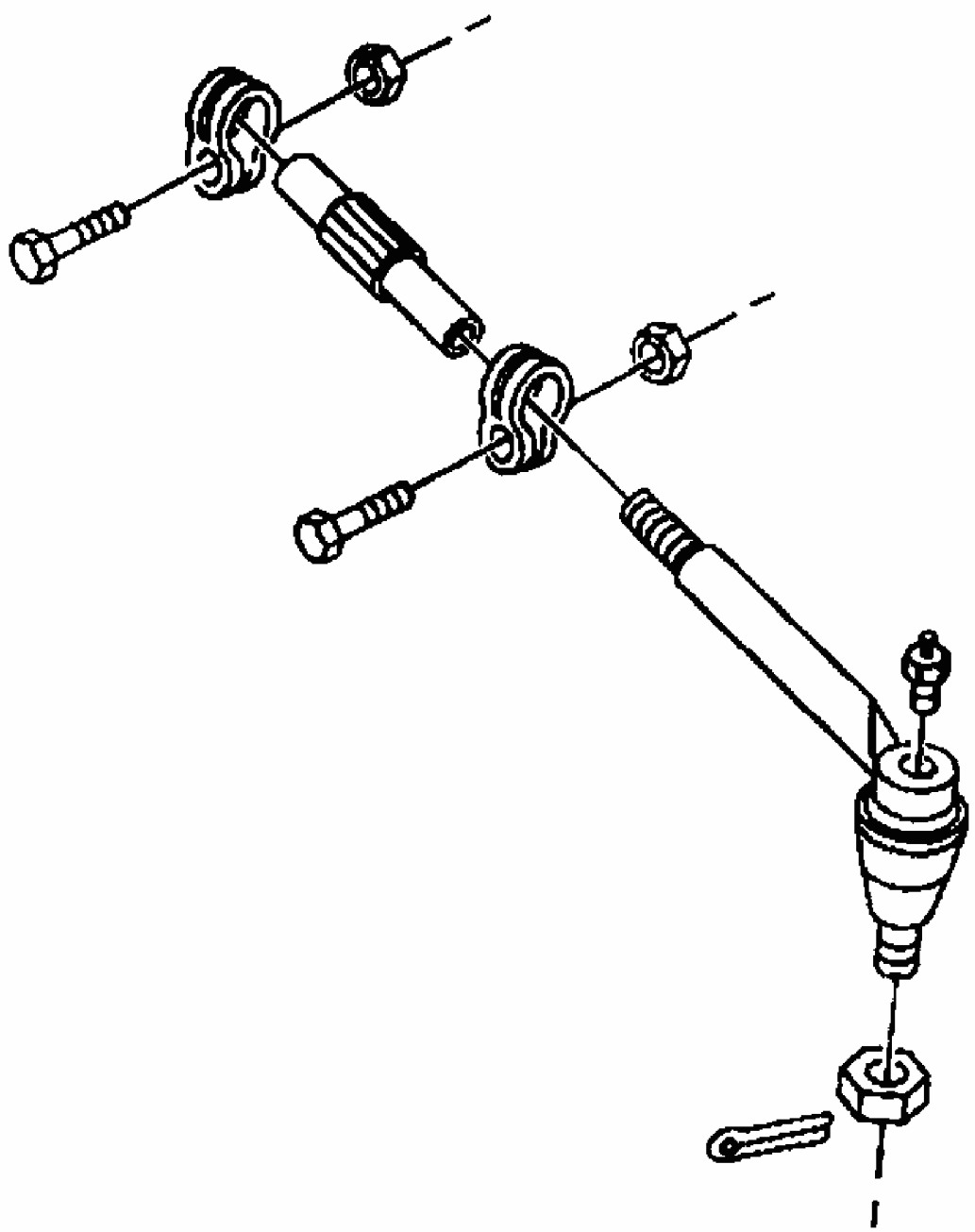

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Fig. 20: Installing Outer Tie Rod Ball Stud To Steering Knuckle
Courtesy of GENERAL MOTORS CORP.

7. Seat the taper using *J 29193* or *J 29194*.

Tighten

Tighten *J 29193* or *J 29194* to 54 N.m (40 lb ft).

8. Remove *J 29193* or *J 29194* from the outer tie rod ball stud.
9. Install the nut to the outer tie rod ball stud.

Tighten

Tighten the outer tie rod ball stud nut to 53 N.m (39 lb ft).

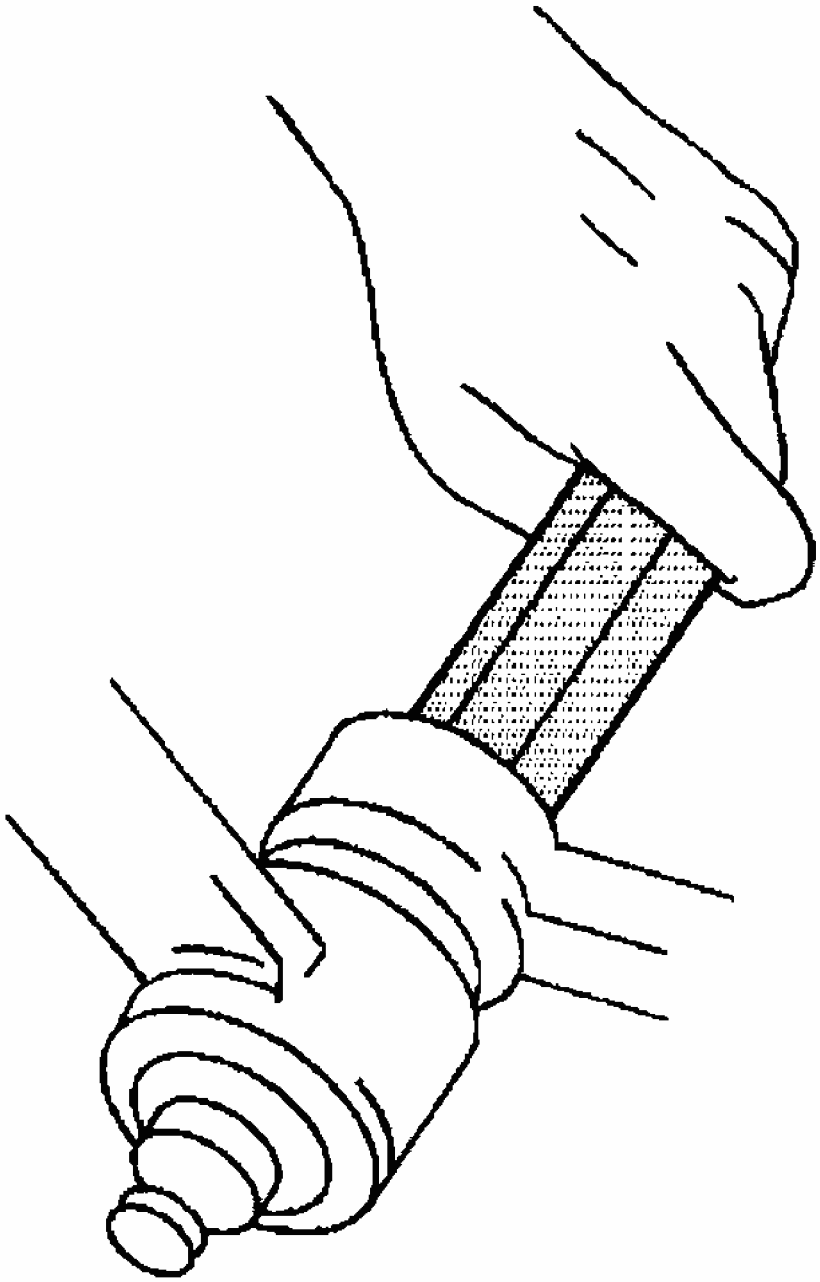

Fig. 21: Tightening Outer Tie Rod Ball Stud Nut
Courtesy of GENERAL MOTORS CORP.

Important: Do not back the nut off in order to align the cotter pin hole. Advance the nut in order to align the nut slot with the cotter pin hole.

10. Install the new cotter pin to outer tie rod nut.

11. Spread the cotter pin ends.
12. Lower the vehicle.
13. Adjust the front toe. Refer to **FRONT TOE ADJUSTMENT** in Wheel Alignment.
14. Position the two clamps (2) between the locating dimples (1) at either end of the adjuster tube.

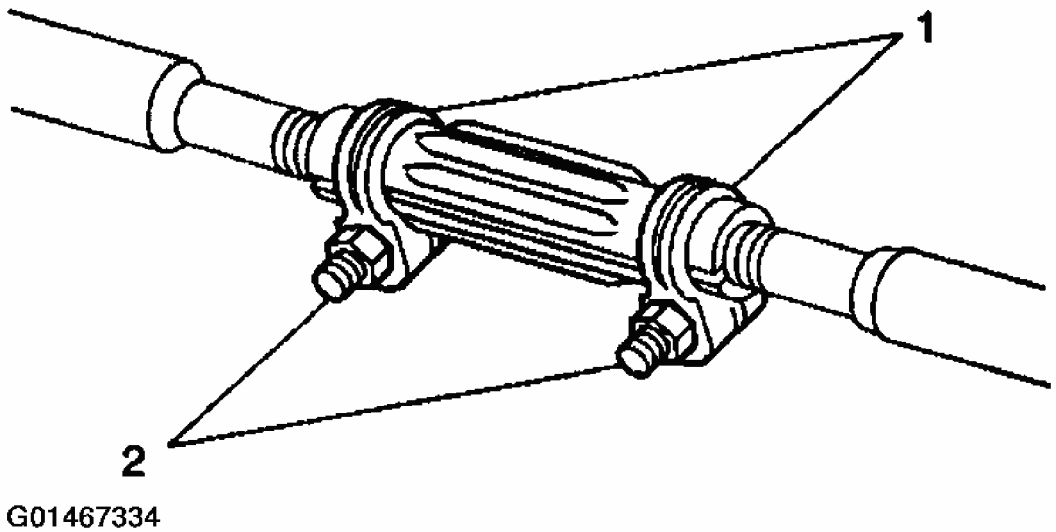

Fig. 22: Positioning Two Clamps Between Dimples At Either End Of Adjuster Tube
Courtesy of GENERAL MOTORS CORP.

15. The clamps must be positioned within the correct angular travel, as shown.
16. Ensure that the clamp slot (2) is not aligned with the adjuster tube slot (1).
17. Maintain the position of each tie rod end as the clamps are tightened in order to ensure free movement of each joint.

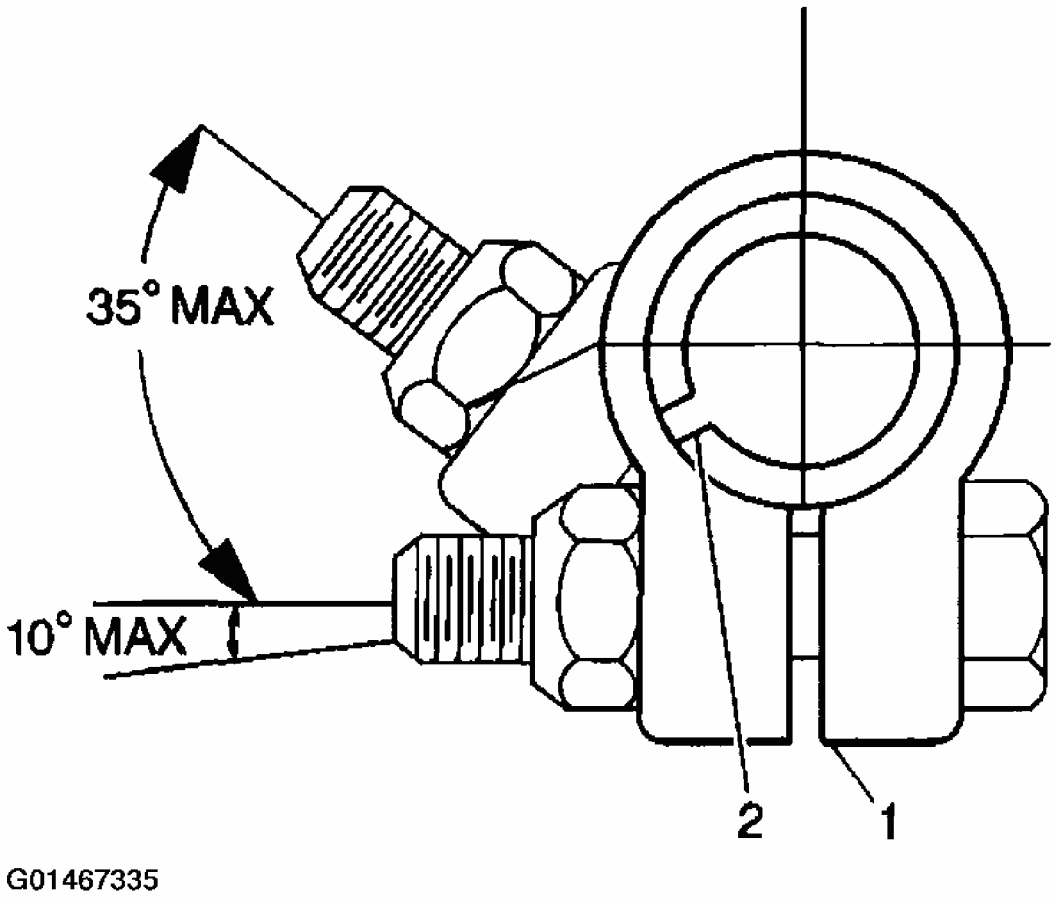

Fig. 23: Identifying Correct Angular Travel Position Of Adjuster Tube Clamp Bolt
Courtesy of GENERAL MOTORS CORP.

18. When clamps are tightened to specifications, the ends may touch.
19. Install the adjuster tube clamp bolts.

Tighten

Tighten the adjuster tube clamp bolts to 21 N.m (16 lb ft).

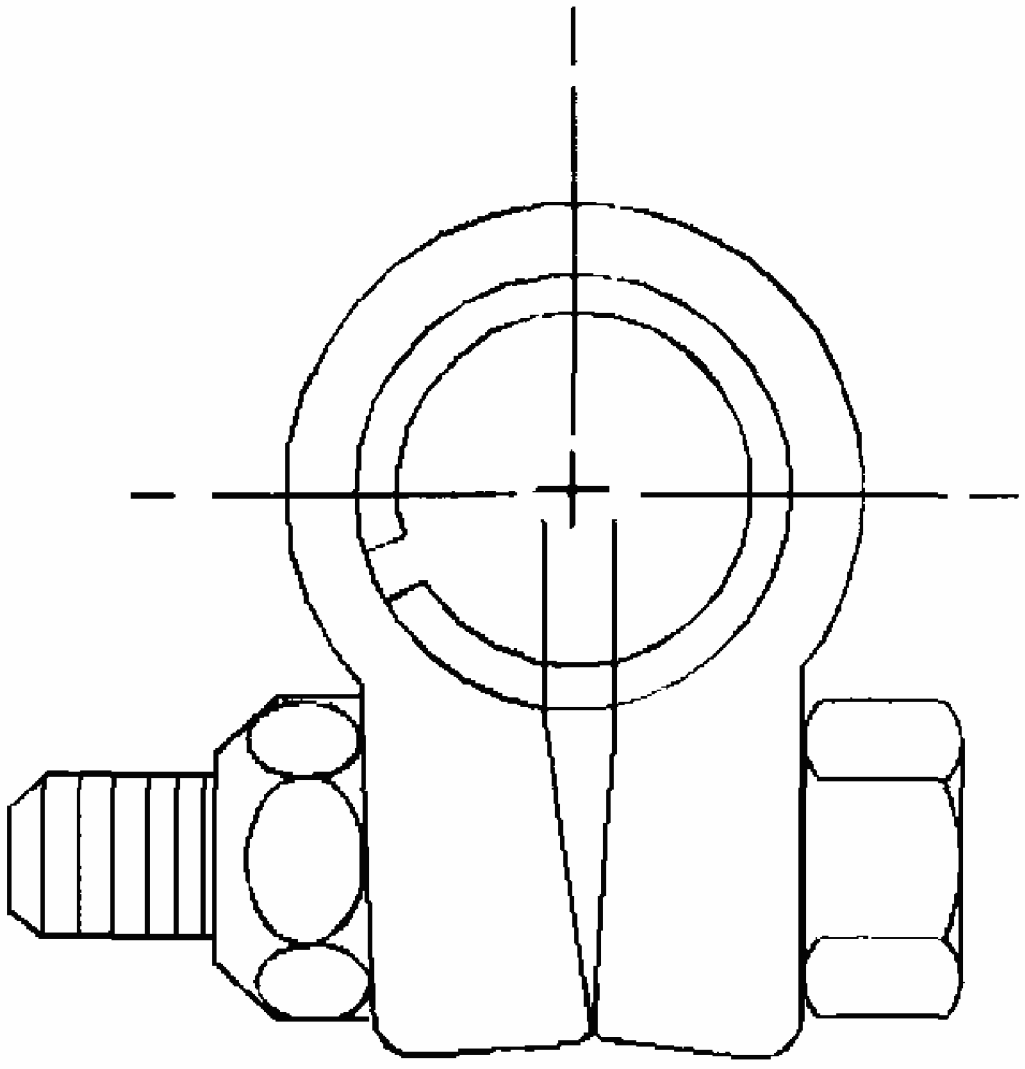

Fig. 24: Identifying Correct Tightening Position Of Adjuster Tube Clamp Bolts
Courtesy of GENERAL MOTORS CORP.

IDLER ARM REPLACEMENT (RWD)

Tools Required

- *J 24319-B* Steering Linkage and Tie Rod Puller
- *J 29193* Steering Linkage Installer (12 mm)
- *J 29194* Steering Linkage Installer (14 mm)

Removal Procedure

1. Raise and suitably support the vehicle with safety stands. Refer to **LIFTING AND JACKING THE VEHICLE** in General Information.
2. Remove the idler arm mounting bolts and nuts from the frame.

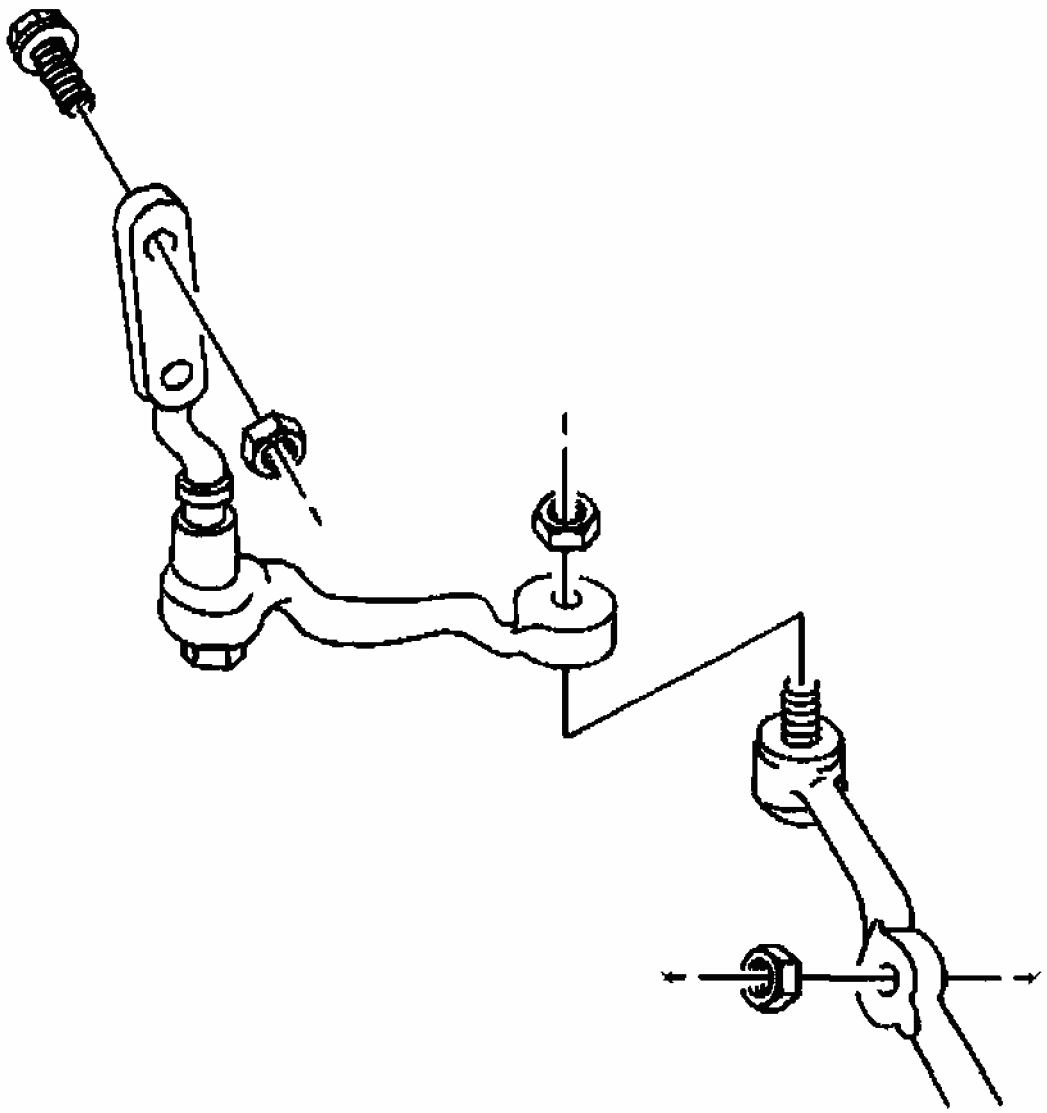

Fig. 25: Removing Idler Arm Mounting Bolts & Nuts From Frame
Courtesy of GENERAL MOTORS CORP.

Important: Use the proper tool in order to separate all ball joints.

3. Remove the relay rod stud nut.

4. Disconnect the relay rod from the idler arm using *J24319-B*.
5. Remove the idler arm.
6. Inspect the ball stud threads for damage.
7. Inspect the ball stud seal for cuts or other damage.
8. Clean the threads on the ball stud.
9. Clean the threads on the ball stud nut.

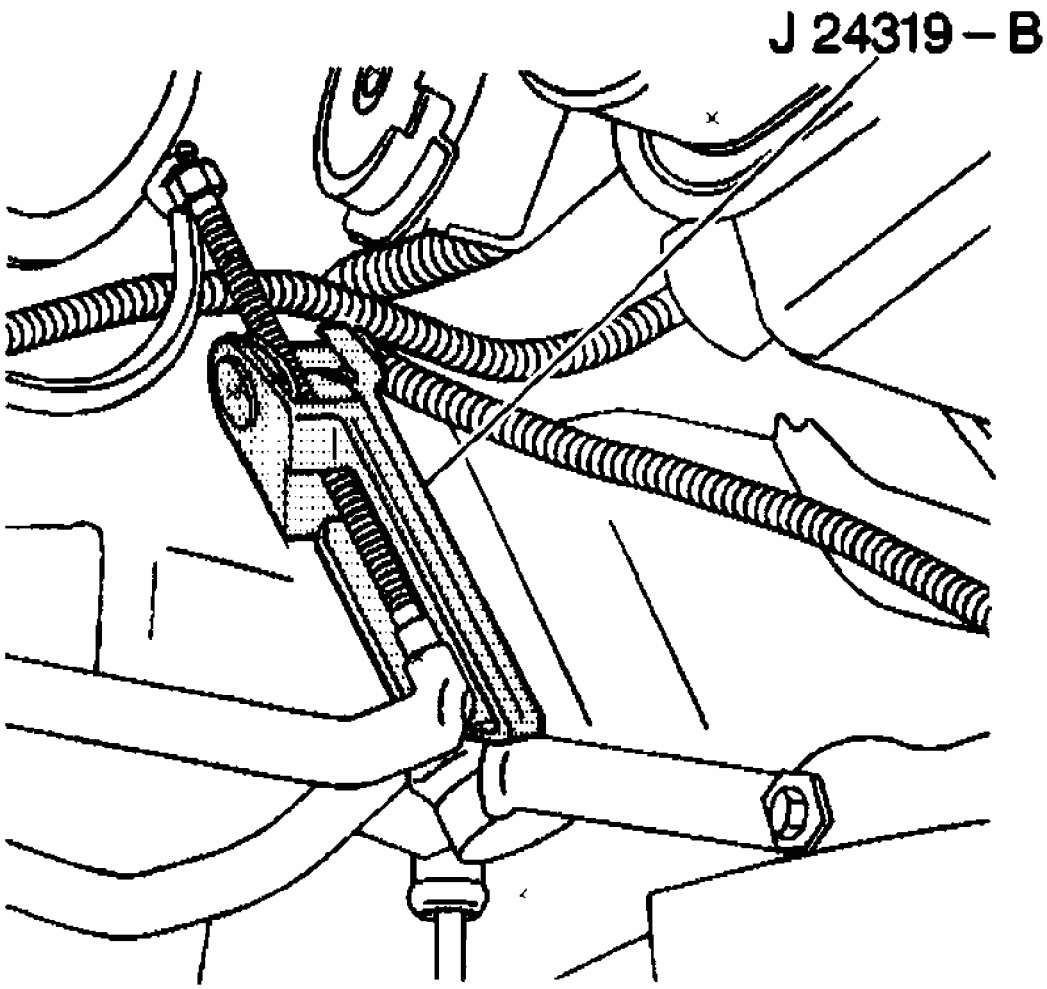

Fig. 26: Disconnecting Relay Rod From Idler Arm
Courtesy of GENERAL MOTORS CORP.

Installation Procedure

1. Position the idler arm on the frame.

NOTE: Refer to FASTENER NOTICE in Cautions and Notices.

2. Install the idler arm mounting bolts and nut to the frame.

   Tighten

   Tighten the idler arm mounting bolts and nuts to 108 N.m (79 lb ft).

3. Install the idler arm to the relay rod ball stud. Ensure that the seal is on the stud.

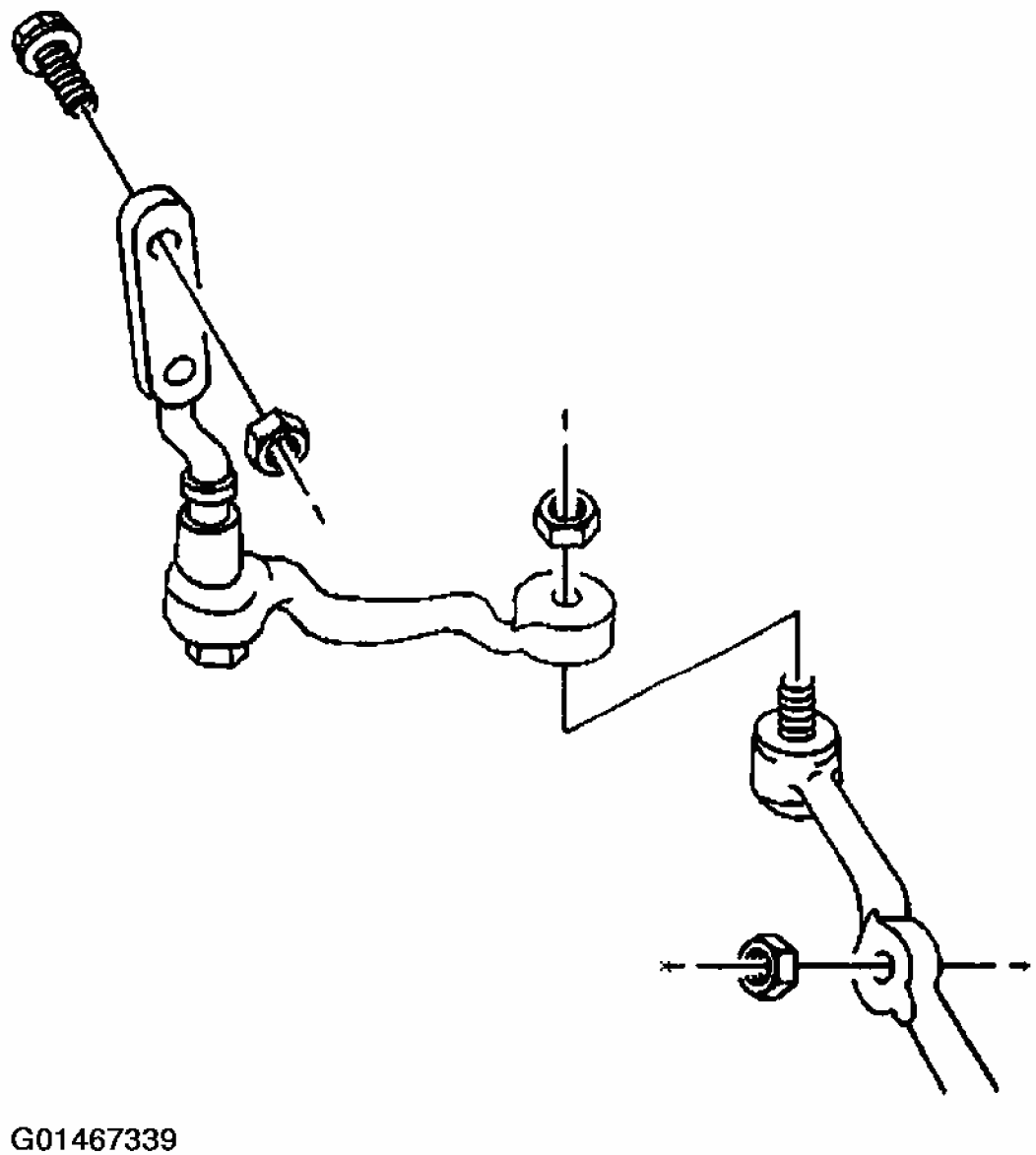

Fig. 27: Installing Idler Arm Mounting Bolts & Nut To Frame

Courtesy of GENERAL MOTORS CORP.

4. Seat the taper using *J 29193* or *J 29194*.

   Tighten

   Tighten the *J 29193* or *J 29194* to 82 N.m (60 lb ft).

5. Remove *J 29193* or *J 29194* from relay rod stud.
6. Install the new nut to the relay rod ball stud.

   Tighten

   Tighten the relay rod ball stud nut to 47 N.m (35 lb ft).

7. Lower the vehicle.
8. Adjust the front toe. Refer to **FRONT TOE ADJUSTMENT** in Wheel Alignment.

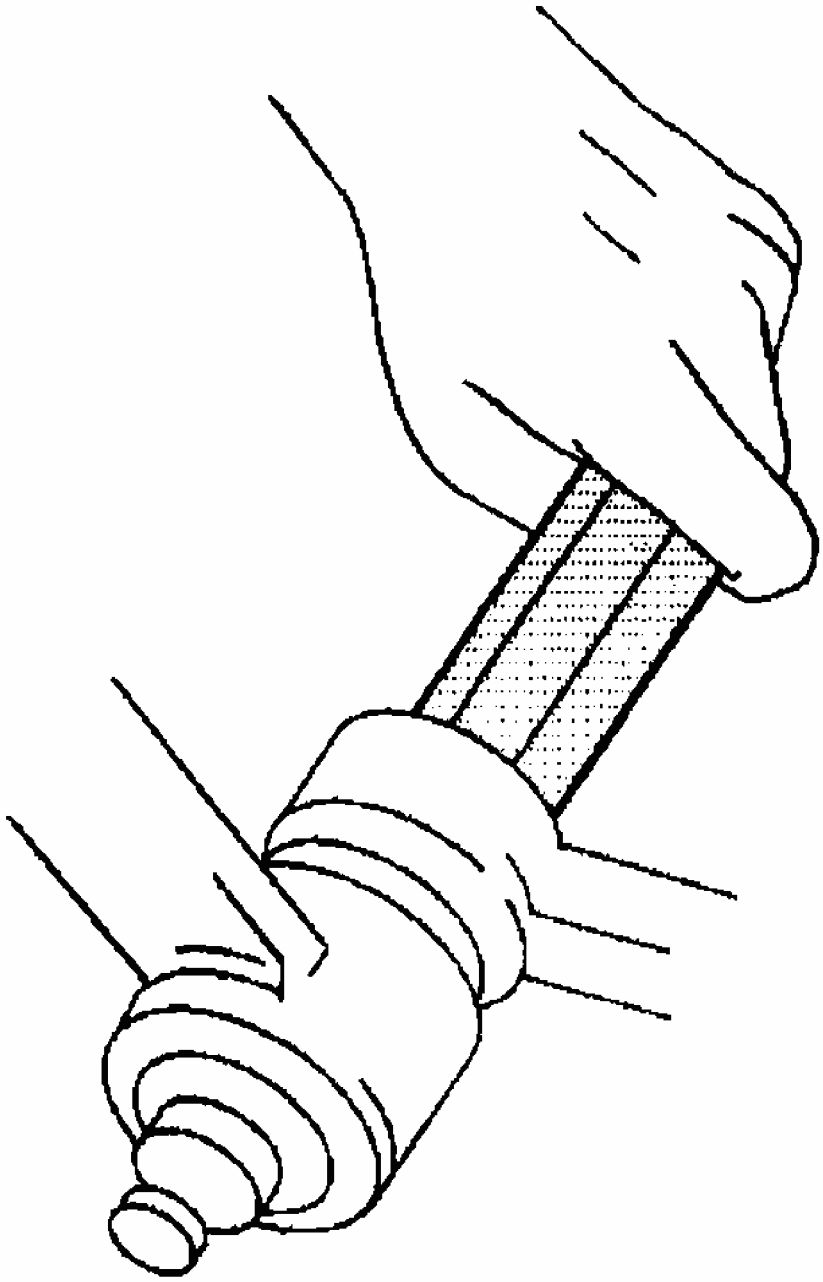

Fig. 28: Tightening Relay Rod Ball Stud Nut
Courtesy of GENERAL MOTORS CORP.

IDLER ARM REPLACEMENT (4WD)

Tools Required

- *J24319-B* Steering Linkage and Tie Rod Puller
- *J 29193* Steering Linkage Installer (12 mm)
- *J 29194* Steering Linkage Installer (14 mm)

Removal Procedure

1. Raise and suitably support the vehicle with safety stands. Refer to **LIFTING AND JACKING THE VEHICLE** in General Information.
2. Remove steering linkage shield. Refer to **STEERING LINKAGE SHIELD REPLACEMENT** .
3. Remove differential carrier shield mounting bolts.
4. Remove differential carrier shield.

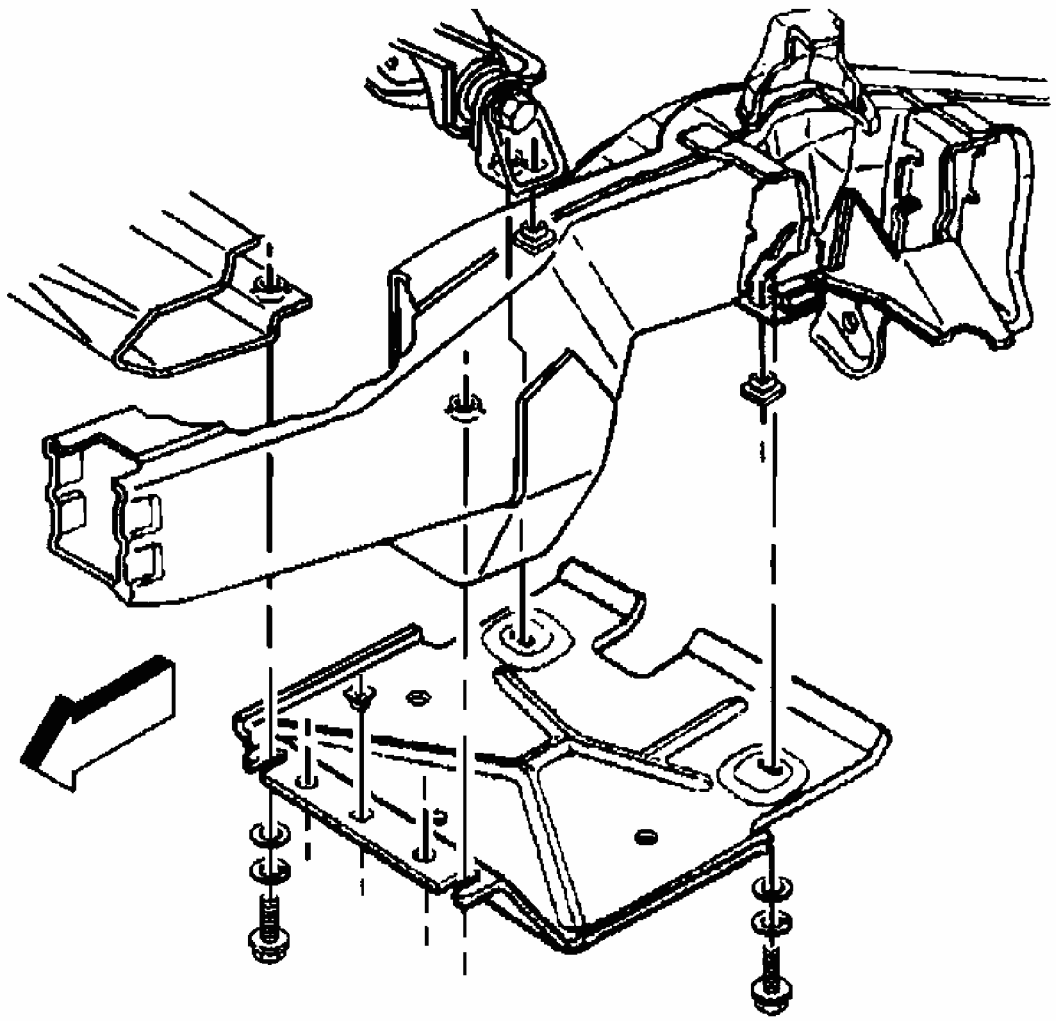

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Fig. 29: Differential Carrier Shield Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

5. Remove the idler arm mounting bolts and nuts from the frame.

   Important: Use the proper tool in order to separate all ball joints.

6. Remove the idler arm ball stud nut.

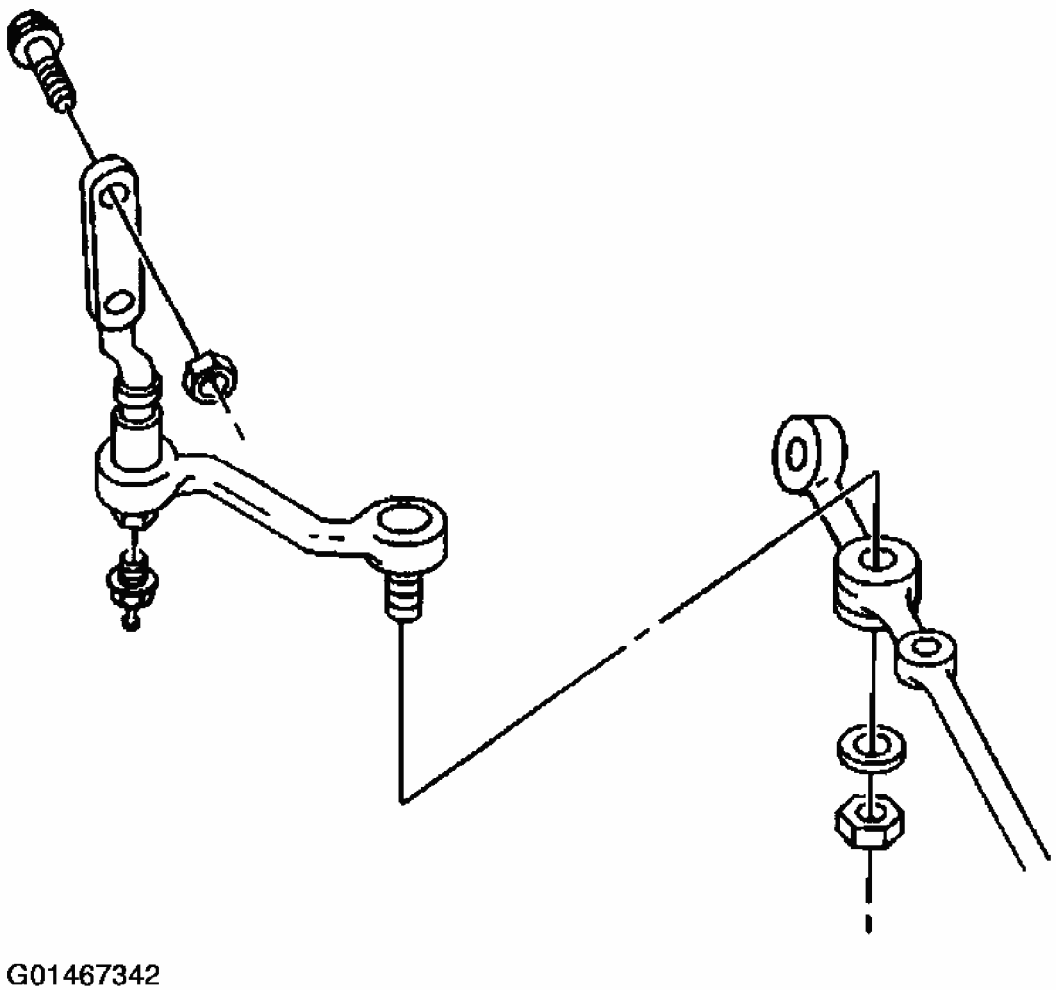

Fig. 30: Removing Idler Arm Mounting Bolts & Nuts From Frame
Courtesy of GENERAL MOTORS CORP.

7. Disconnect the relay rod from the idler arm using *J24319-B.*
8. Remove the idler arm.
9. Inspect the ball stud threads for damage.
10. Inspect the ball stud seal for cuts or other damage.

11. Clean the threaded ball stud.
12. Clean the threads on the ball stud nut.

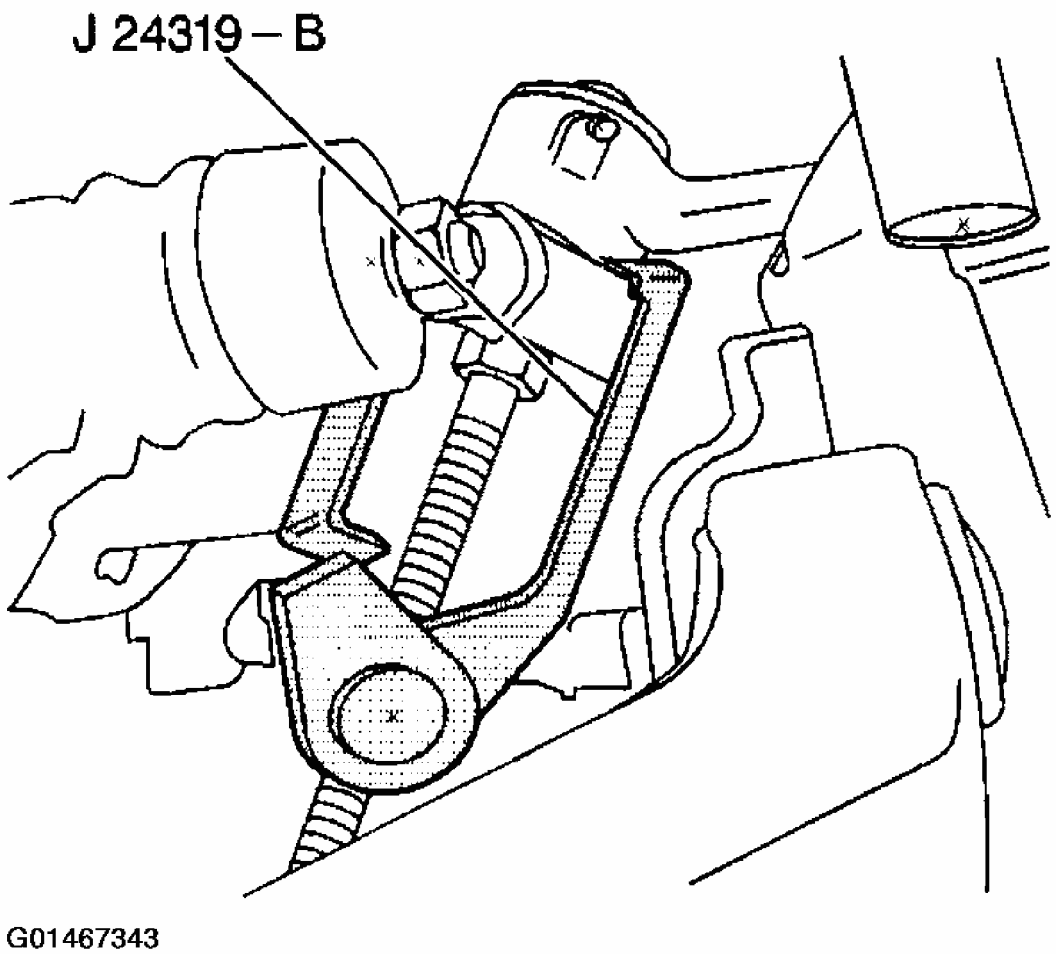

Fig. 31: Disconnecting Relay Rod From Idler Arm
Courtesy of GENERAL MOTORS CORP.

Installation Procedure

1. Position the idler arm on the frame.

NOTE: Refer to FASTENER NOTICE in Cautions and Notices.

2. Install the idler arm mounting bolts and nuts to the frame.

Tighten

Tighten the idler arm mounting bolt and nuts to 108 N.m (79 lb ft).

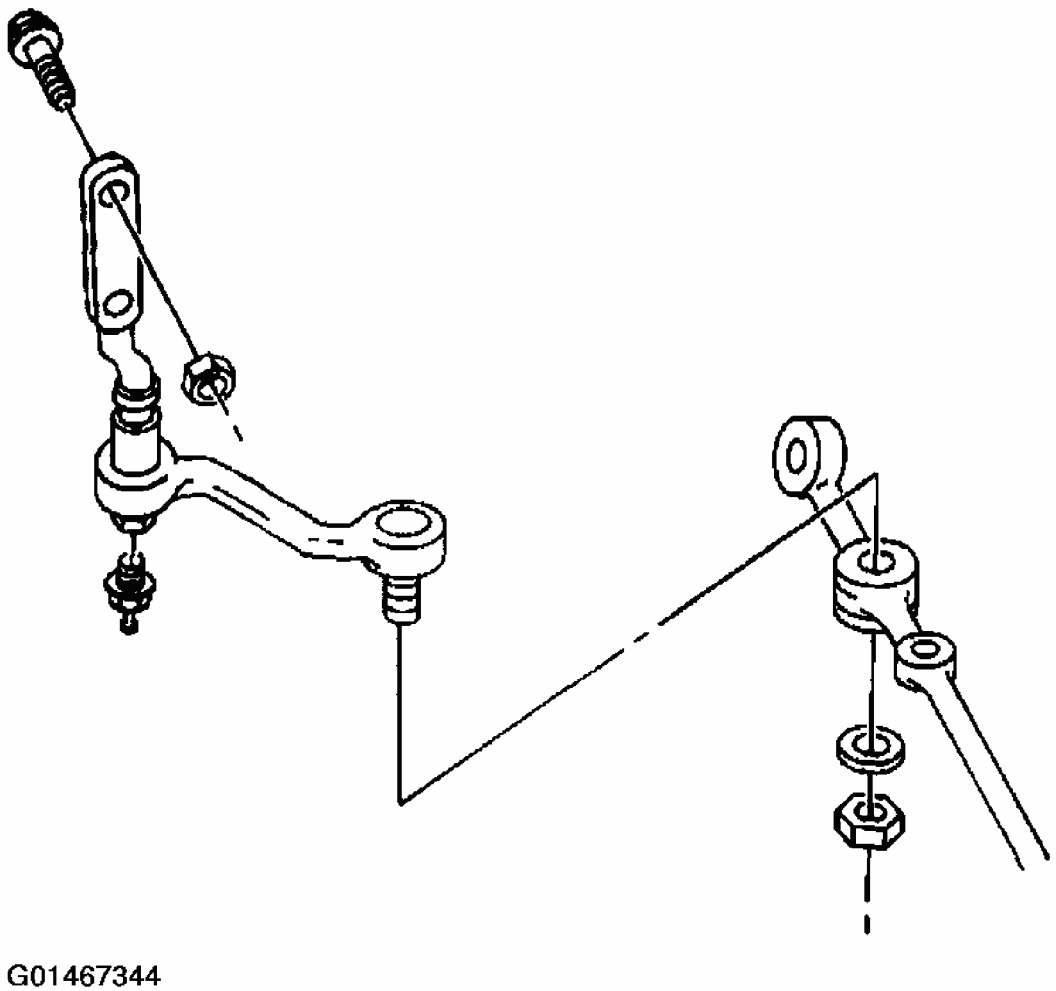

Fig. 32: Installing Idler Arm Mounting Bolts & Nuts To Frame
Courtesy of GENERAL MOTORS CORP.

3. Install the relay rod to the idler arm ball stud. Ensure that the seal is on the stud.
4. Seat the taper using *J 29193* or *J 29194*.

Tighten

Tighten the *J 29193* or *J 29194* to 54 N.m (40 lb ft).

5. Remove *J 29193* or *J 29194* from the idler arm ball stud.
6. Install the new nut to the idler arm ball stud.

Tighten

Tighten the idler arm ball stud nut to 82 N.m (60 lb ft).

7. Install differential carrier shield.
8. Install differential carrier shield mounting bolts.

   Tighten

   Tighten the differential carrier shield mounting bolts to 25 N.m (19 lb ft).

9. Install steering linkage shield. Refer to **STEERING LINKAGE SHIELD REPLACEMENT** .
10. Lower the vehicle.
11. Adjust the front toe. Refer to **FRONT TOE ADJUSTMENT** in Wheel Alignment.

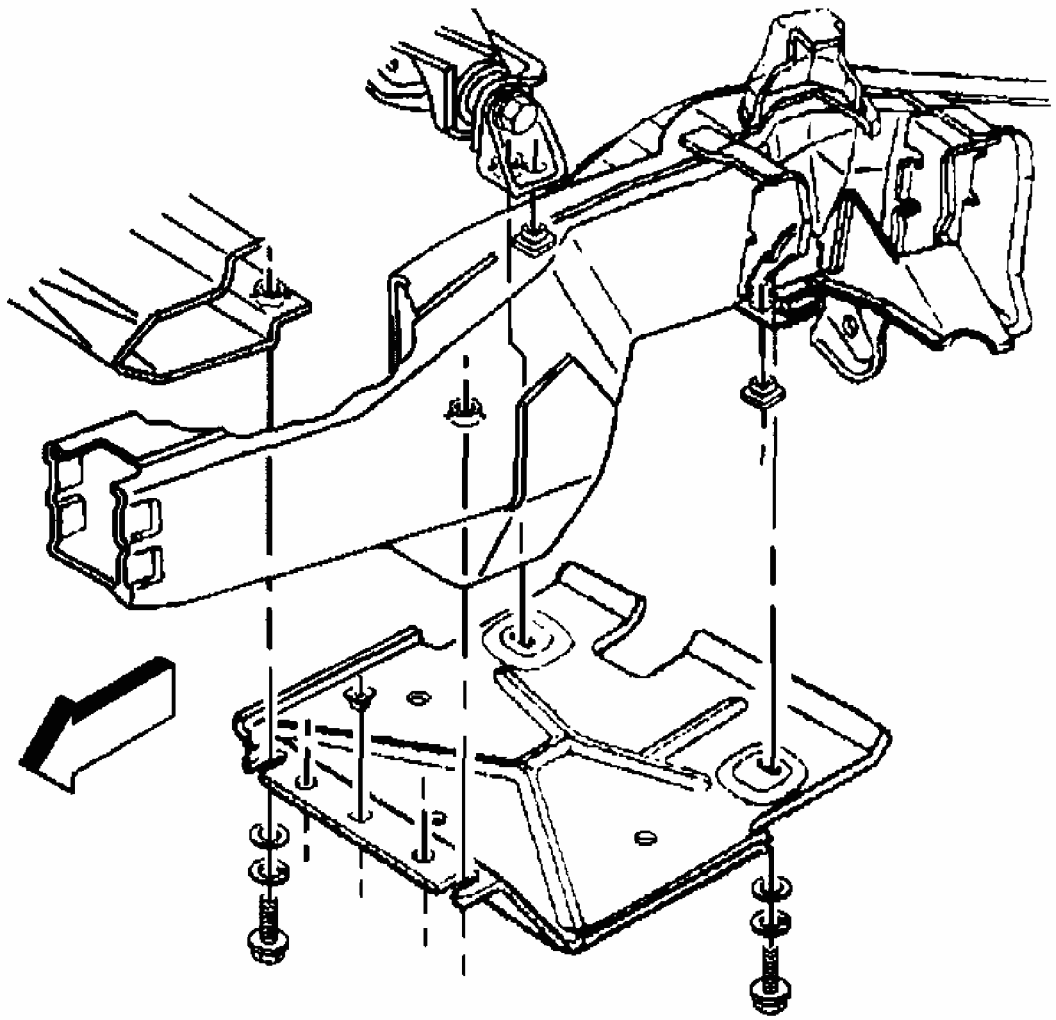

Fig. 33: Differential Carrier Shield Mounting Bolts

Courtesy of GENERAL MOTORS CORP.

RELAY ROD REPLACEMENT (RWD)

Tools Required

- *J 6627-A* Tie Rod Puller
- *J 24319-B* Steering Linkage and Tie Rod Puller
- *J 29193* Steering Linkage Installer (12 mm)
- *J 29194* Steering Linkage Installer (14 mm)

Removal Procedure

1. Raise and suitably support the vehicle with safety stands. Refer to **LIFTING AND JACKING THE VEHICLE** in General Information.
2. Remove the inner tie rods ball stud nuts.

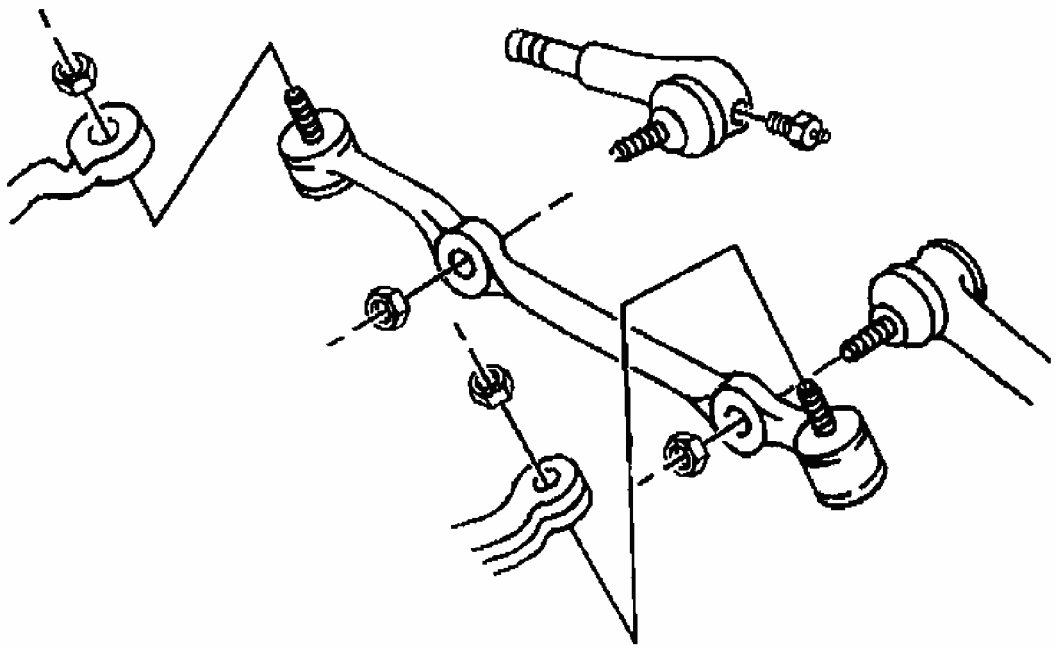

Fig. 34: Inner Tie Rods Ball Stud Nuts
Courtesy of GENERAL MOTORS CORP.

Important: Use the proper tool in order to separate all ball joints.

3. Disconnect the inner tie rods ball studs from the relay rod using *J 6627-A*.

4. Remove the relay rod ball stud nut at the pitman arm.

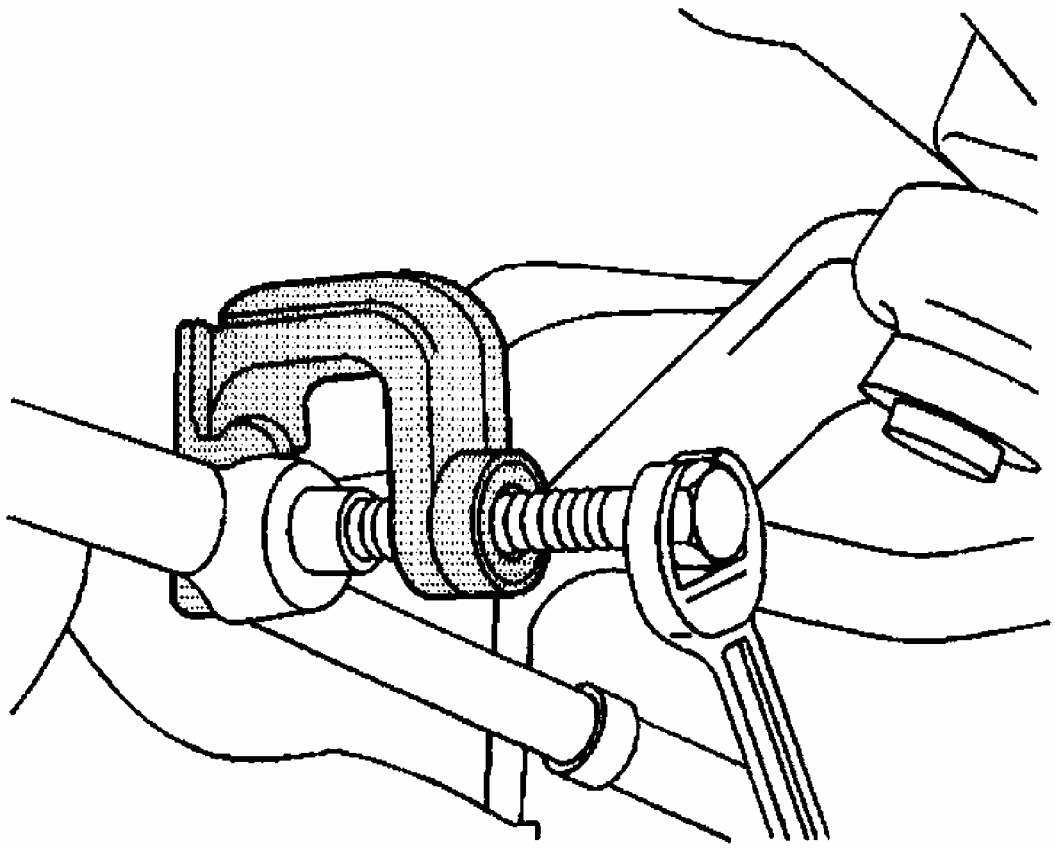

Fig. 35: Disconnecting Inner Tie Rods Ball Studs From Relay Rod
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the relay rod ball stud from the pitman arm using *J24319-B*.
6. Remove the relay rod ball stud nut at the idler arm.

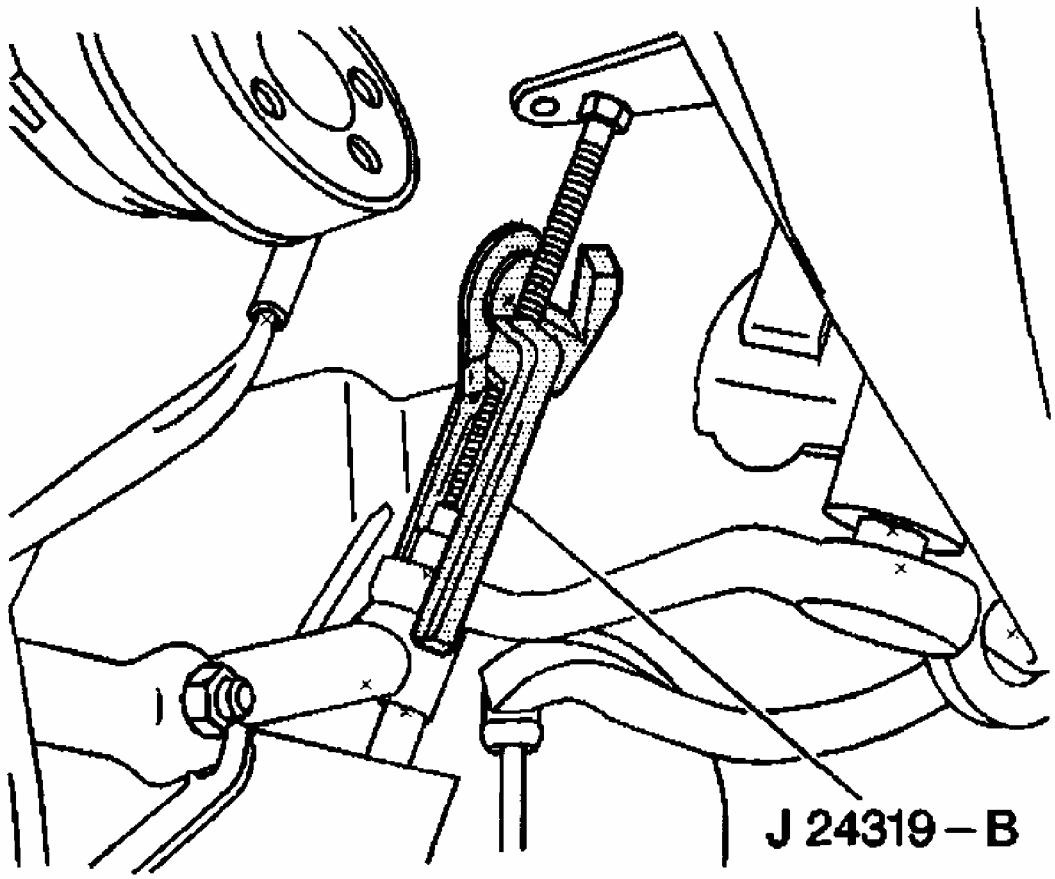

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Fig. 36: Disconnecting Relay Rod Ball Stud From Pitman Arm
Courtesy of GENERAL MOTORS CORP.

7. Disconnect the relay rod from the idler arm using *J24319-B*.
8. Remove the relay rod.
9. Inspect the following components:
   - The threads on the tie rod for damage
   - The threads on the tie rod end for damage
   - The ball stud threads for damage
   - The ball stud seals for excessive wear
10. Clean the threads on the ball stud and ball stud nut.

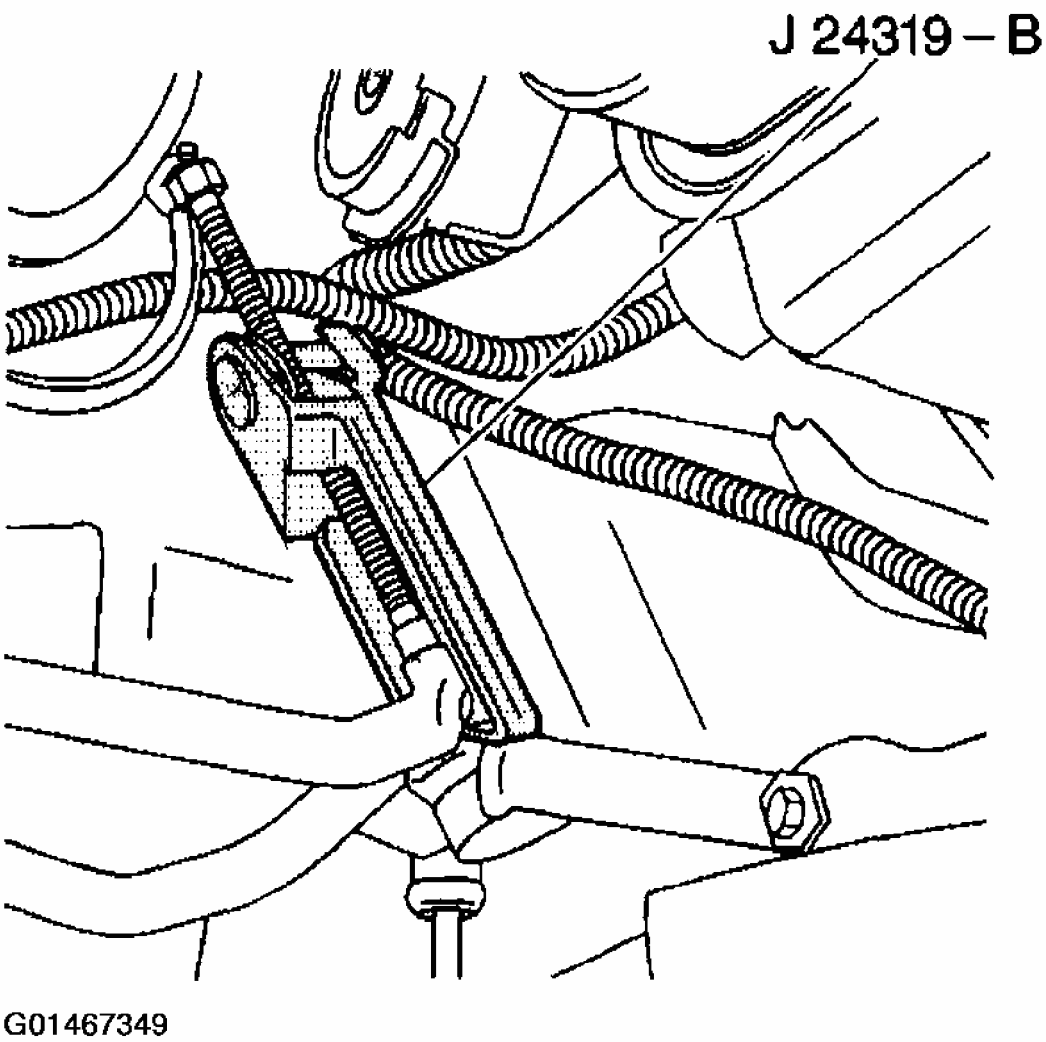

Fig. 37: Disconnecting Relay Rod From Idler Arm
Courtesy of GENERAL MOTORS CORP.

Installation Procedure

1. Install the relay rod ball stud to the idler arm. Ensure that the seal is on the stud.

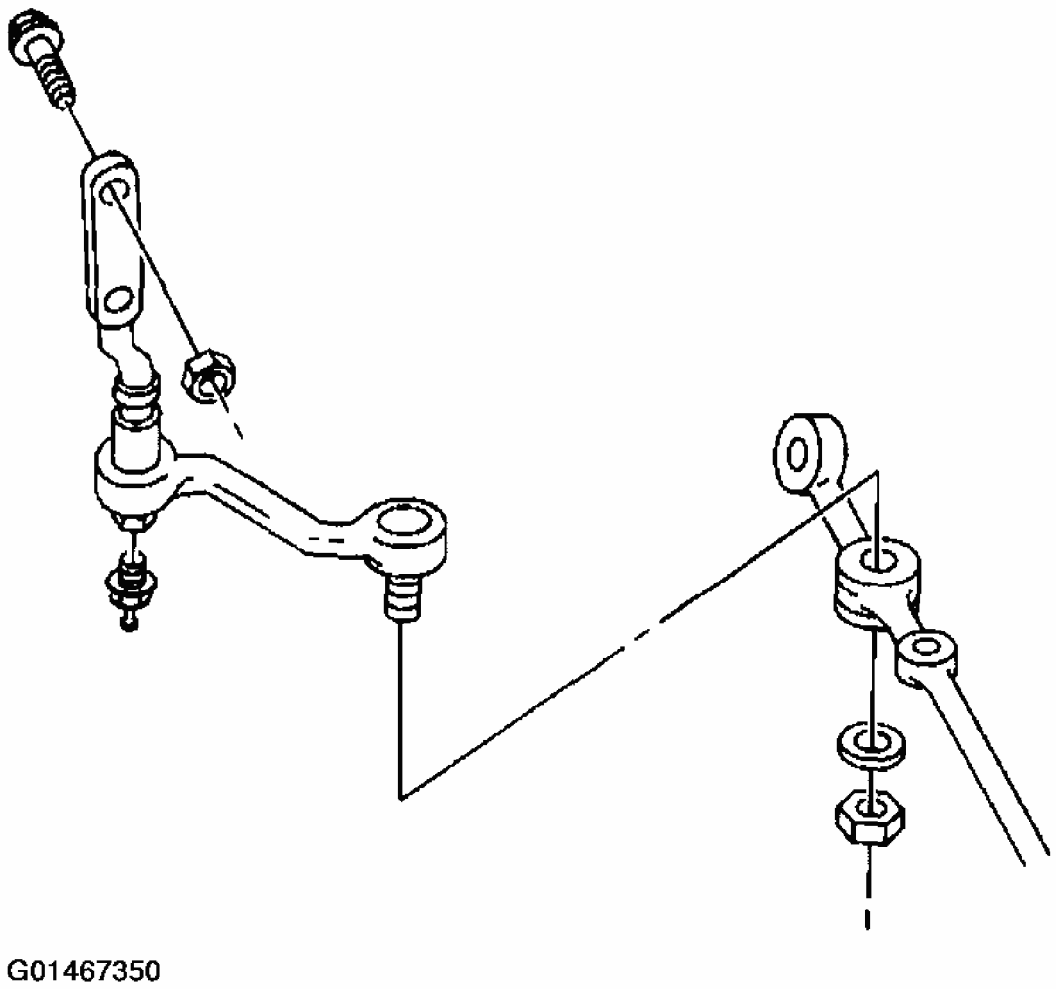

Fig. 38: Installing Relay Rod Ball Stud To Idler Arm
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to FASTENER NOTICE in Cautions and Notices.

2. Seat the taper using *J 29193* or *J 29194*.

Tighten

Tighten *J 29193* or *J 29194* to 54 N.m (40 lb ft)

3. Remove *J 29193* or *J 29194* from relay rod ball stud.
4. Install the new nut to the relay rod ball stud at the idler arm.

Tighten

Tighten the relay rod ball stud nut at the idler arm to 47 N.m (35 lb in).

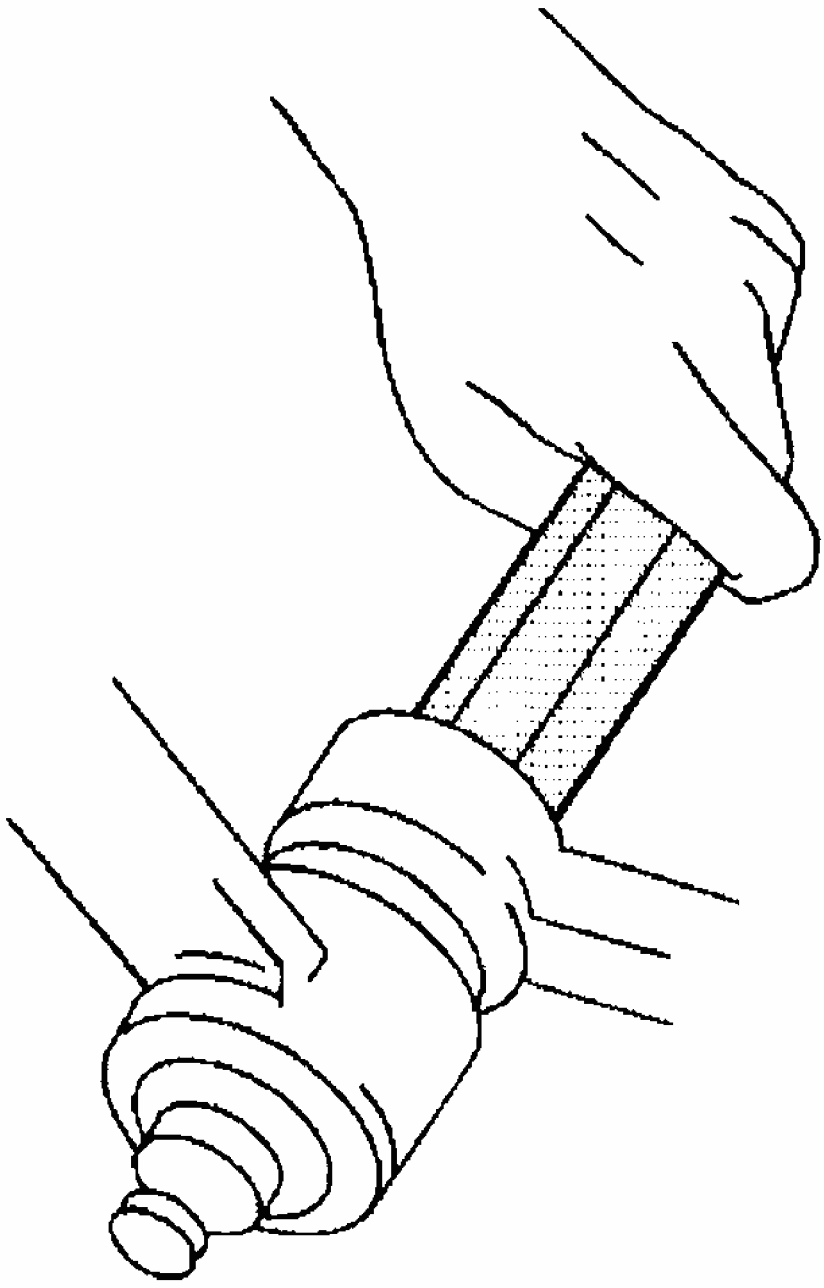

Fig. 39: Tightening Relay Rod Ball Stud Nut At Idler Arm
Courtesy of GENERAL MOTORS CORP.

5. Install the relay rod ball stud to the pitman arm. Ensure that the seal is on the stud.

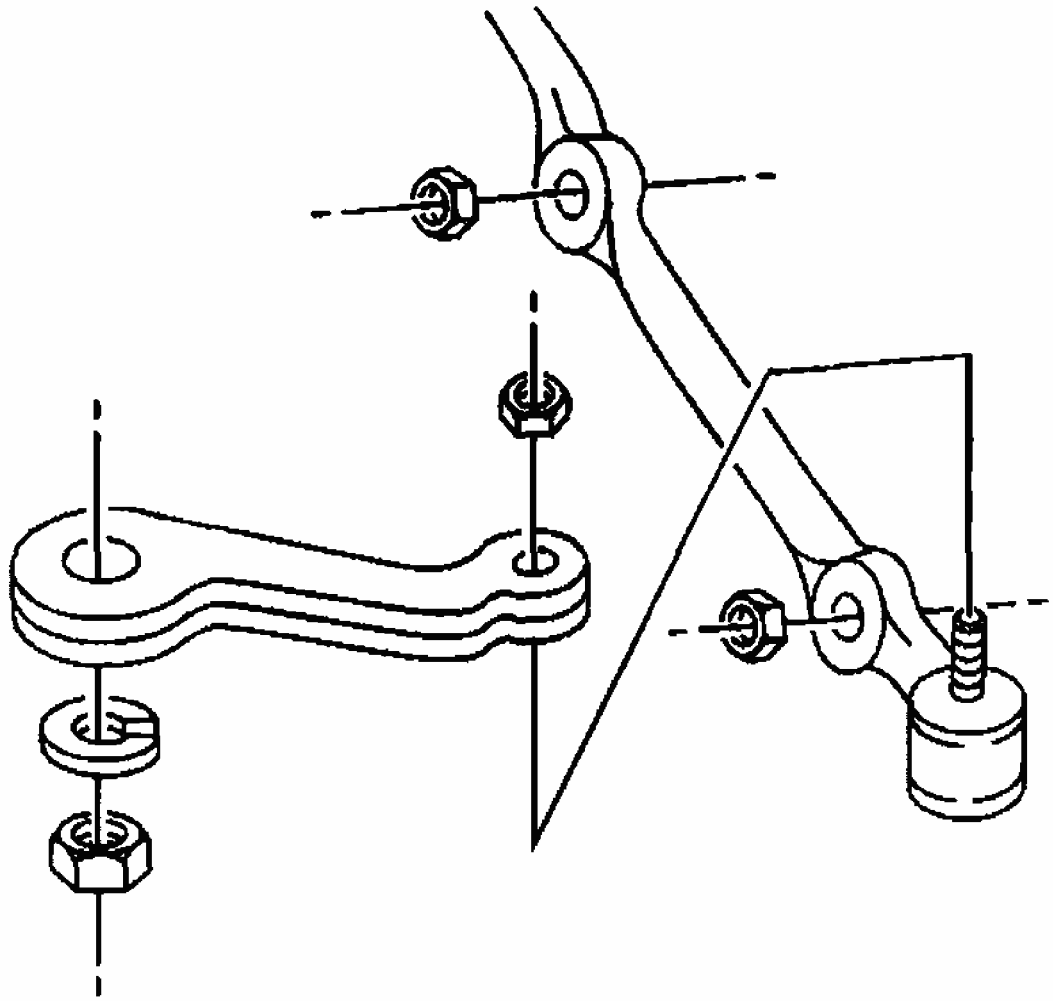

Fig. 40: Installing Relay Rod Ball Stud To Pitman Arm
Courtesy of GENERAL MOTORS CORP.

6. Seat the taper using *J 29193* or *J 29194*.

Tighten

Tighten *J 29193* or J29194 to 54 N.m (40 lb ft).

7. Remove *J 29193* or *J 29194* from relay rod ball stud.
8. Install the new nut to the relay rod ball stud at the pitman arm.

Tighten

Tighten the relay rod ball stud nut at the pitman arm to 48 N.m (36 lb ft).

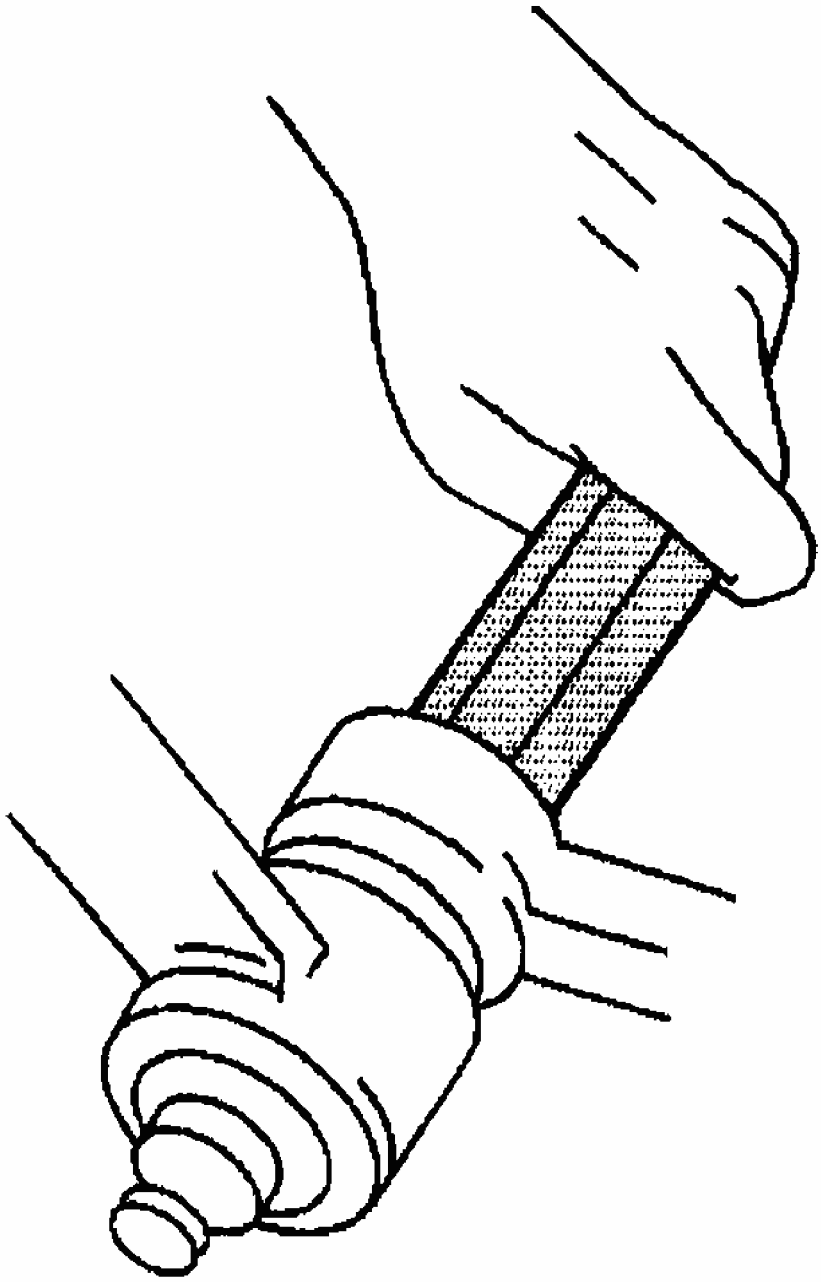

Fig. 41: Tightening Relay Rod Ball Stud Nut At Pitman Arm
Courtesy of GENERAL MOTORS CORP.

9. Install the inner tie rod ball studs to the relay rod. Ensure that the seal is on the stud.
10. Seat the taper using *J 29193* or *J 29194* .

Tighten

Tighten *J 29193* or *J 29194* to 54 N.m (40 lb ft).

11. Remove *J 29193* or *J 29194* from relay rod ball stud.

    Repeat steps 10 and 11 for opposite inner tie rod to relay rod.

12. Install the new nuts to the inner tie rod ball studs.

    Tighten

    Tighten the inner tie rod ball studs nuts to 47 N.m (35 lb ft).

13. Lower the vehicle.
14. Adjust the front toe. Refer to **FRONT TOE ADJUSTMENT** in Wheel Alignment.

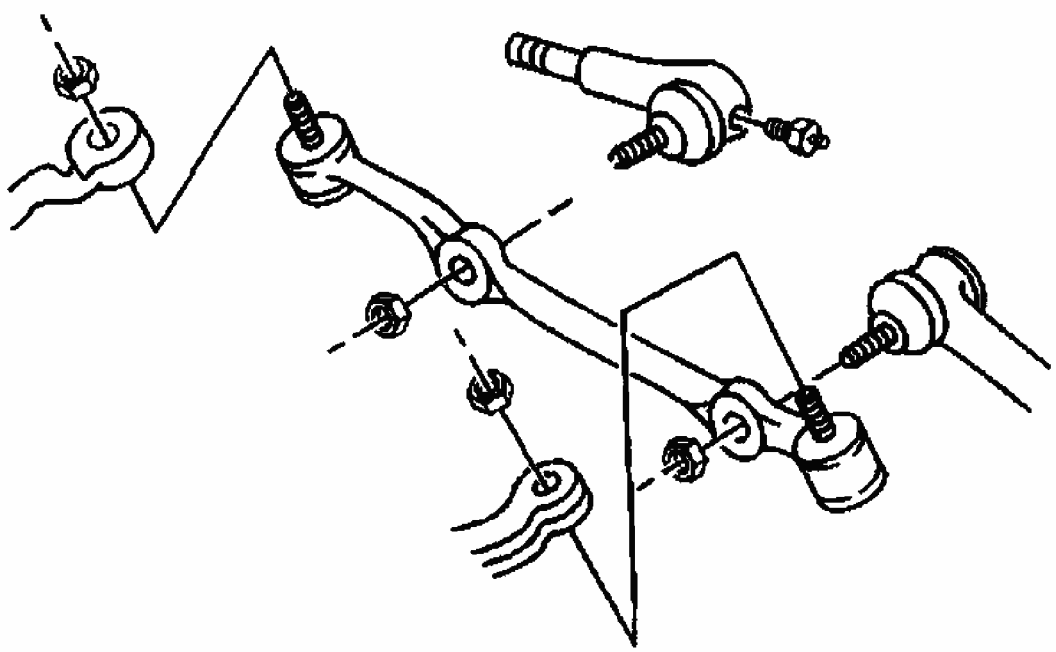

Fig. 42: Installing Inner Tie Rod Ball Studs To Relay Rod
Courtesy of GENERAL MOTORS CORP.

RELAY ROD REPLACEMENT (4WD)

Tools Required

- *J 6627-A* Tie Rod Puller
- *J24319-B* Steering Linkage and Tie Rod Puller

- *J29193* Steering Linkage Installer (12 mm)
- *J29194* Steering Linkage Installer (14 mm)

Removal Procedure

1. Raise and suitably support the vehicle with safety stands. Refer to **LIFTING AND JACKING THE VEHICLE** in General Information.

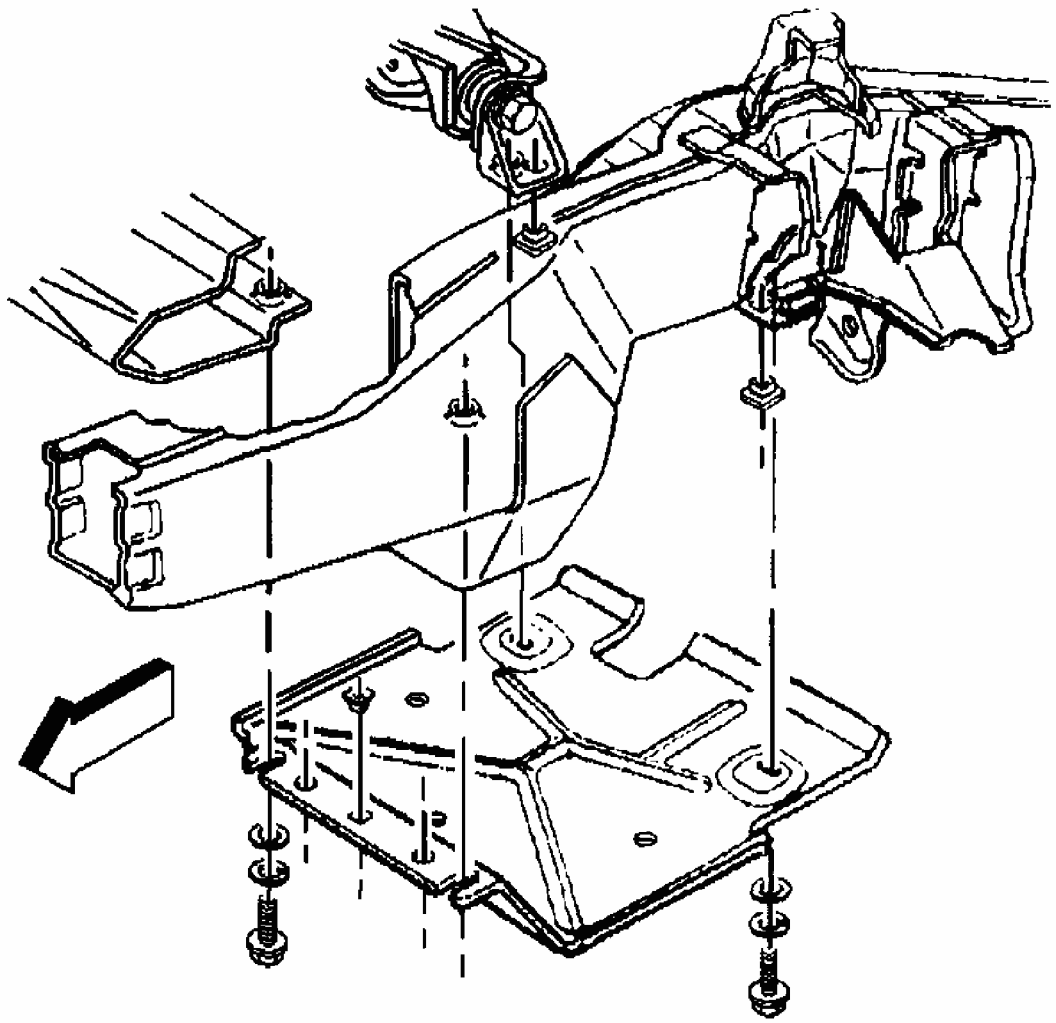

Fig. 43: Differential Carrier Shield Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

2. Remove the steering linkage shield. Refer to **STEERING LINKAGE SHIELD REPLACEMENT** .
3. Remove the differential carrier shield mounting bolts.

4. Remove the differential carrier shield.

   Important: Use the proper tool in order to separate all ball joints.

5. Remove inner tie rods ball stud nuts.

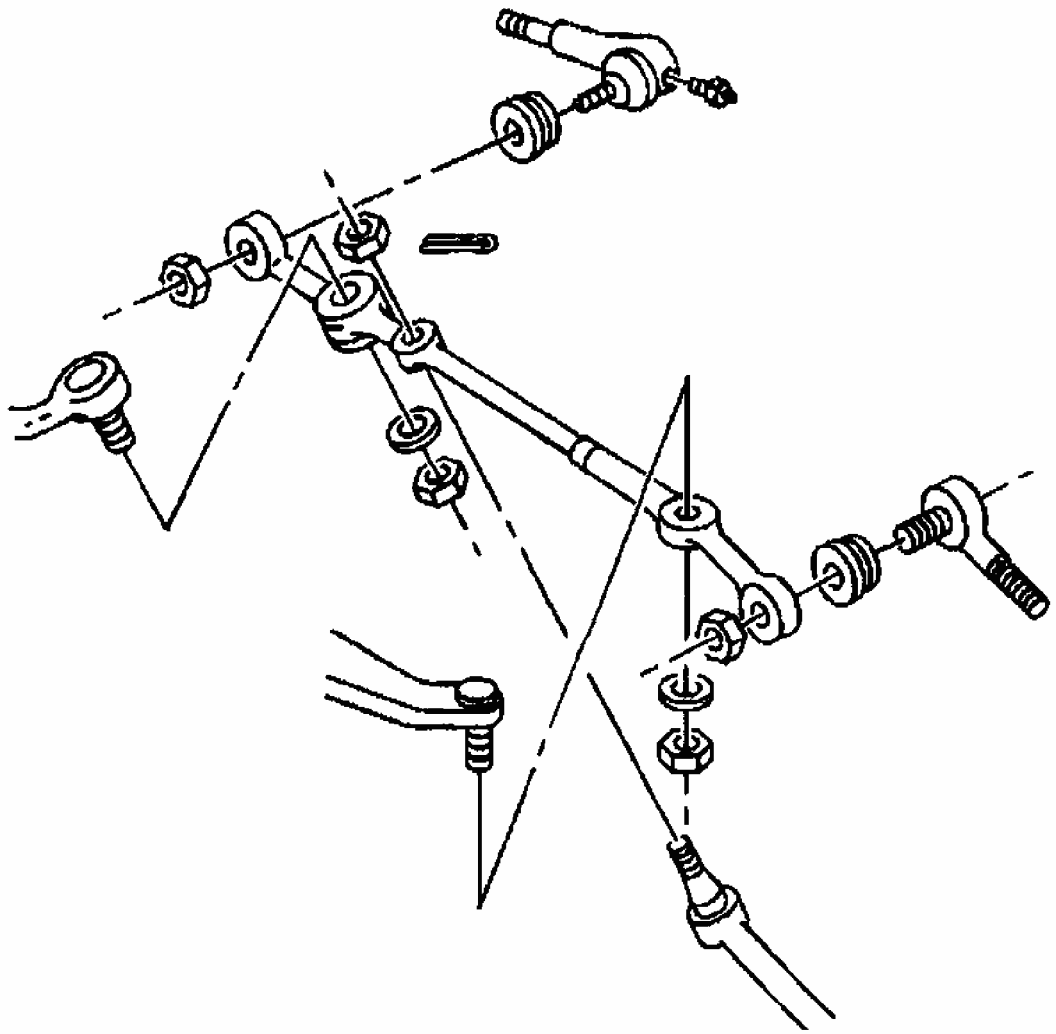

Fig. 44: Inner Tie Rods Ball Stud Nuts
Courtesy of GENERAL MOTORS CORP.

6. Remove the inner tie rods ball studs from the relay rod using *J 6627-A*.

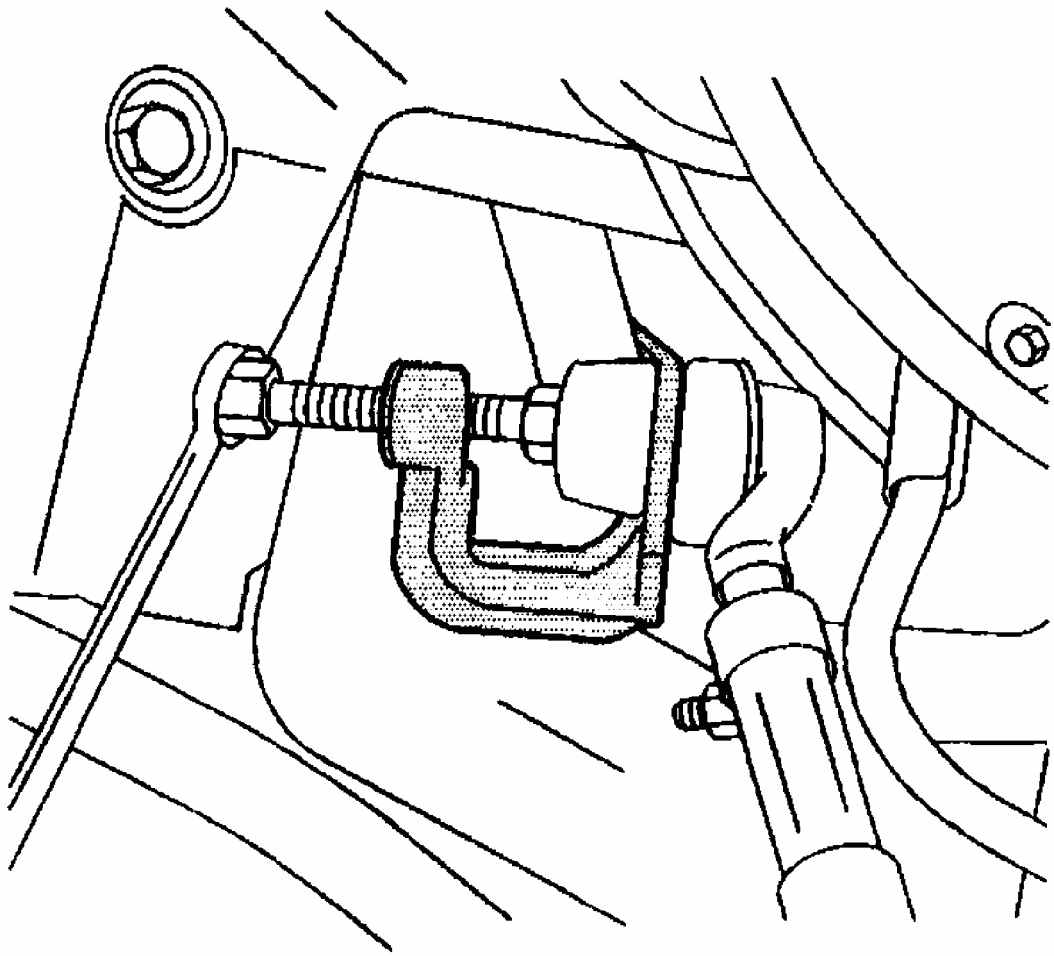

Fig. 45: Removing Inner Tie Rods Ball Studs From Relay Rod
Courtesy of GENERAL MOTORS CORP.

7. Remove the steering shock absorber ball stud nut at the relay rod.

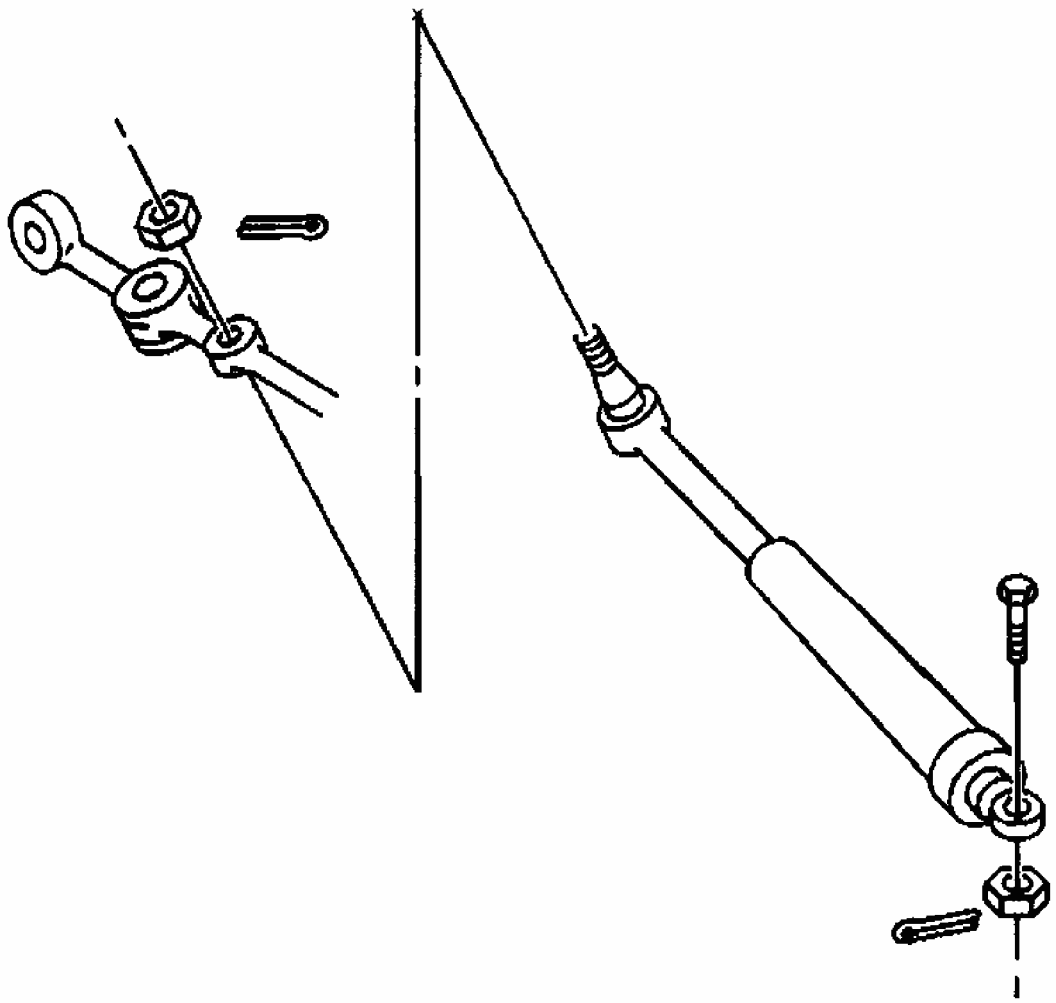

Fig. 46: Removing Steering Shock Absorber Ball Stud Nut At Relay Rod
Courtesy of GENERAL MOTORS CORP.

8. Disconnect the steering shock absorber from the relay rod using *J 24319-B* .

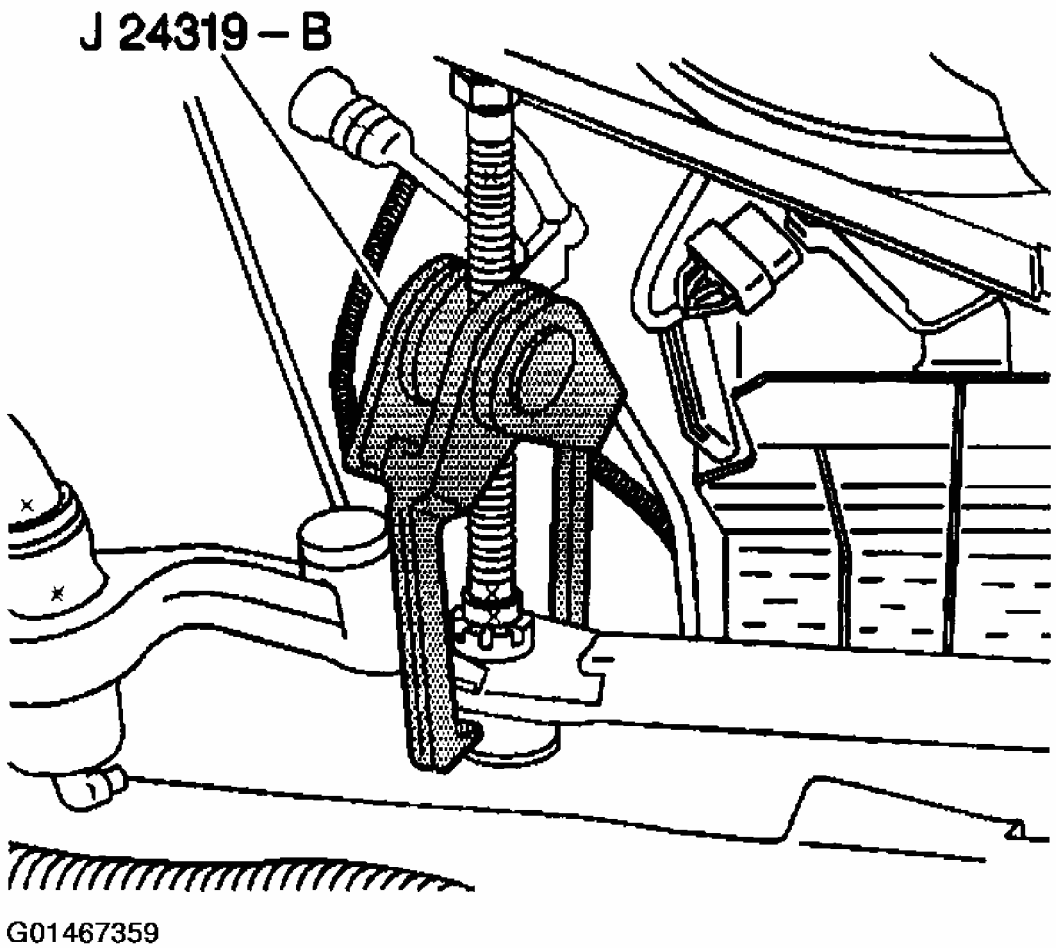

Fig. 47: Disconnecting Steering Shock Absorber From Relay Rod
Courtesy of GENERAL MOTORS CORP.

9. Remove the pitman arm ball stud nut at the relay rod.

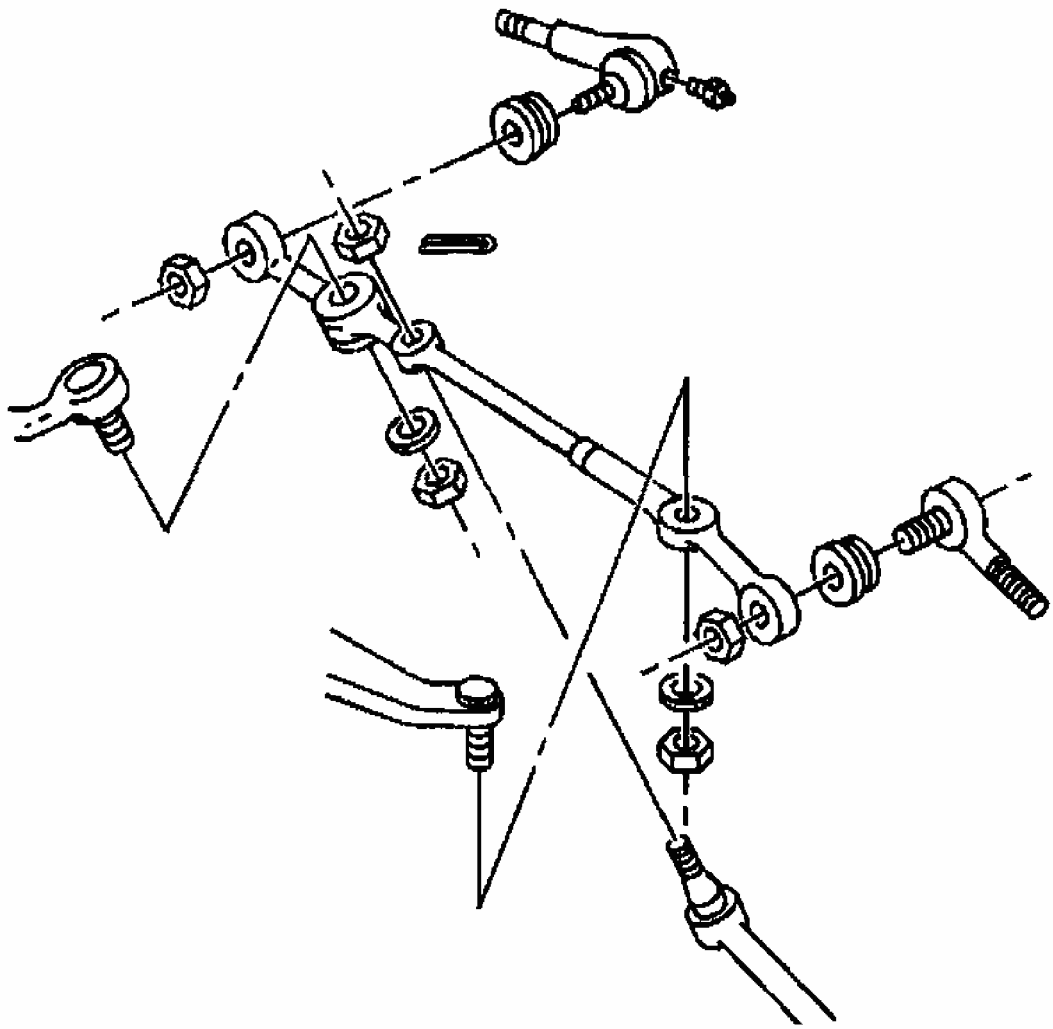

Fig. 48: Removing Pitman Arm Ball Stud Nut At Relay Rod
Courtesy of GENERAL MOTORS CORP.

10. Disconnect the pitman arm ball stud from the relay rod using *J24319-B*.

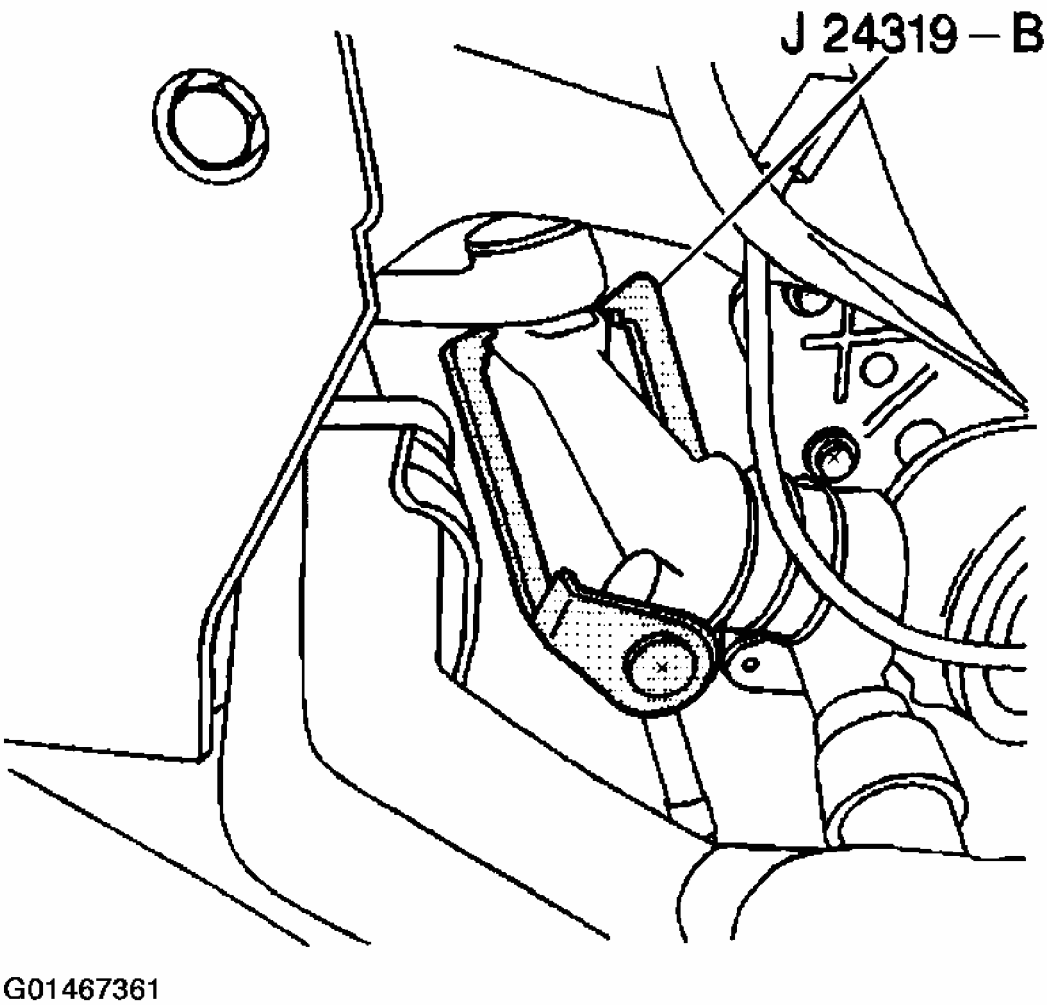

Fig. 49: Disconnecting Pitman Arm Ball Stud From Relay Rod
Courtesy of GENERAL MOTORS CORP.

11. Remove the idler arm ball stud nut at the relay rod.

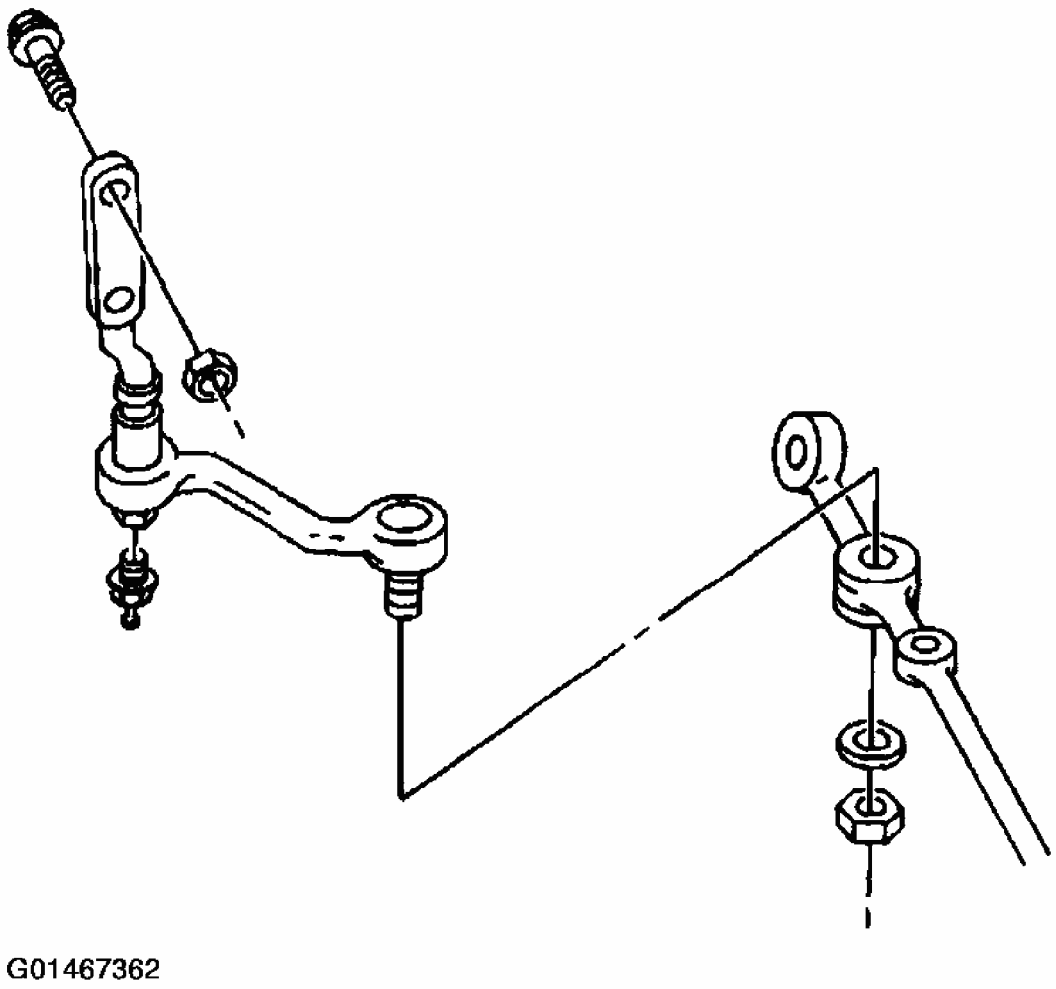

Fig. 50: Removing Idler Arm Ball Stud Nut At Relay Rod
Courtesy of GENERAL MOTORS CORP.

12. Disconnect the idler arm ball stud from the relay rod using *J24319-B*.
13. Remove the relay rod.
14. Inspect the following components:
    - The threads on the tie rod for damage
    - The threads on the tie rod end for damage
    - The ball stud threads for damage
    - The ball stud seals for excessive wear
15. Clean the threads on the ball stud and ball stud nut.

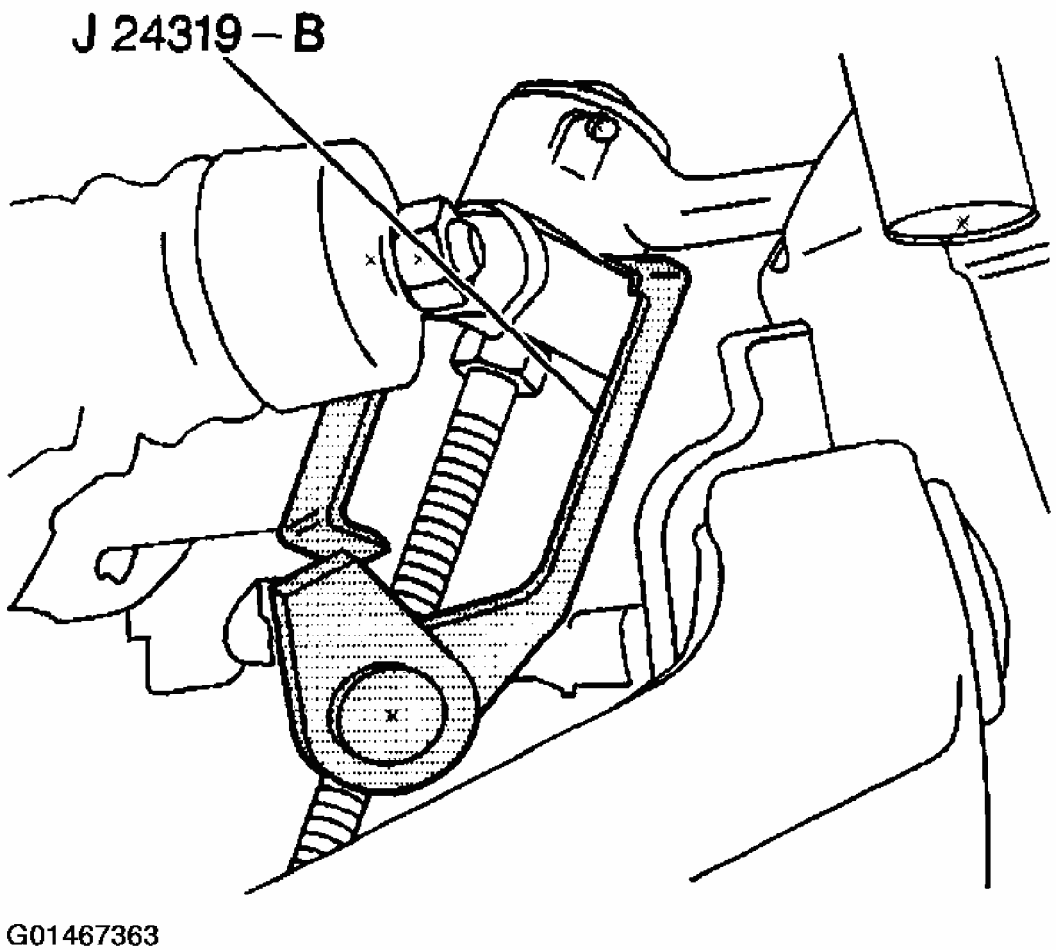

Fig. 51: Disconnecting Idler Arm Ball Stud From Relay Rod
Courtesy of GENERAL MOTORS CORP.

Installation Procedure

1. Install the idler arm ball stud to the relay rod. Ensure that the seal is on the stud.

   NOTE: Refer to FASTENER NOTICE in Cautions and Notices.

2. Seat the taper using *J 29193* or *J 29194*.

   Tighten

   Tighten *J 29193* or *J 29194* to 54 N.m (40 lb ft).

3. Remove *J 29193* or *J 29194* from the idler arm ball stud.
4. Install the new nut to the idler arm ball stud at the relay rod.

Tighten

Tighten the idler arm ball stud nut to 82 N.m (60 lb ft).

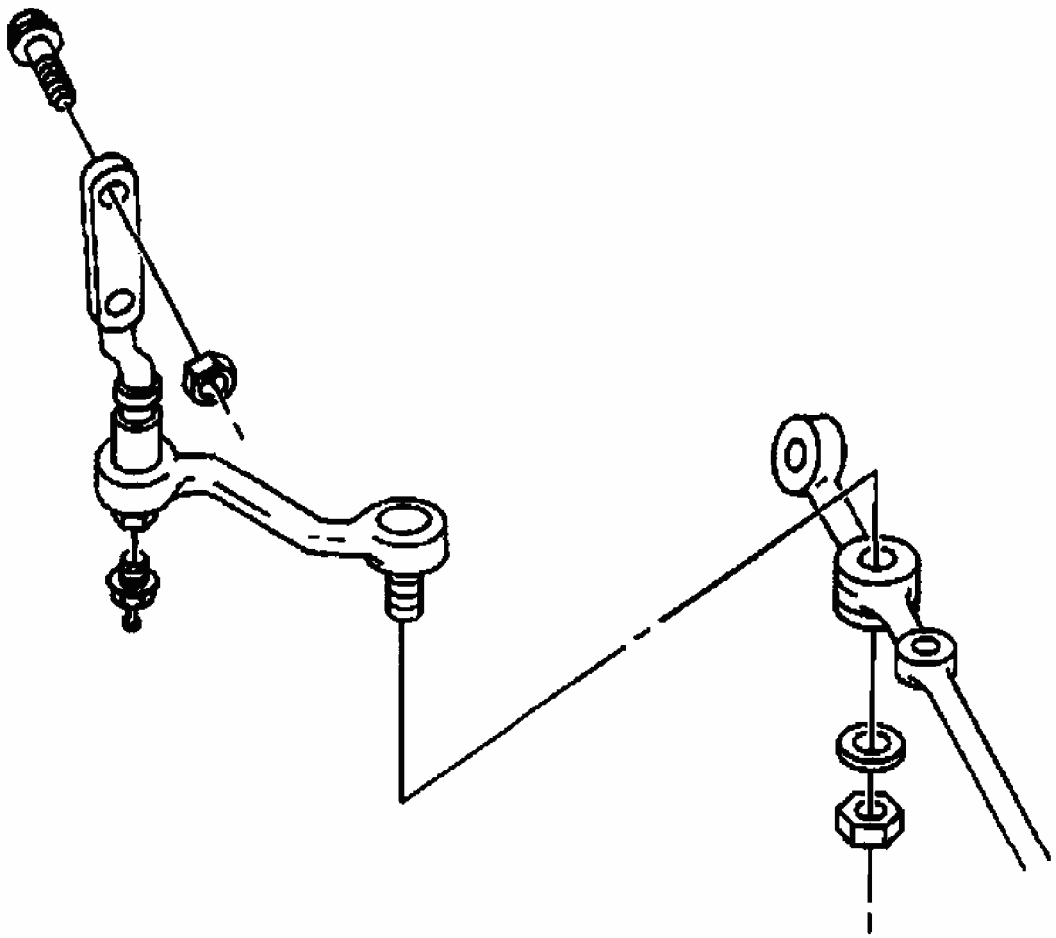

Fig. 52: Installing Idler Arm Ball Stud To Relay Rod
Courtesy of GENERAL MOTORS CORP.

5. Install the relay rod ball stud to the pitman arm. Ensure that the seal is on the stud.
6. Seat the taper using *J 29193* or *J 29194*.

Tighten

Tighten J29193 or *J 29194* to 54 N.m (40 lb ft).

7. Remove *J 29193* or *J 29194* from the pitman arm ball stud.
8. Install the new nut to the pitman arm ball stud at the relay rod.

Tighten

Tighten the pitman arm ball stud nut to 83 N.m (61 lb ft).

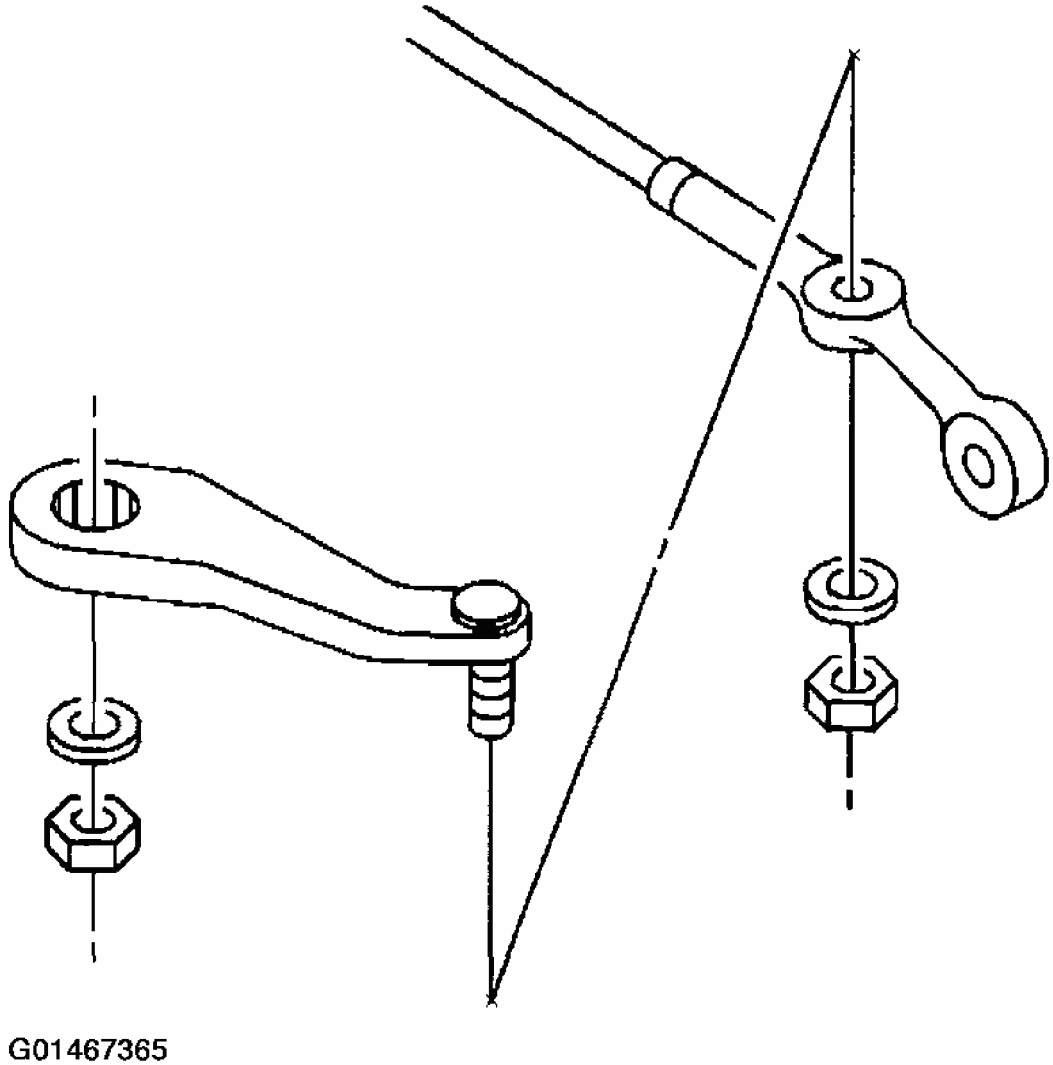

Fig. 53: Installing Relay Rod Ball Stud To Pitman Arm
Courtesy of GENERAL MOTORS CORP.

9. Connect the steering shock absorber to the relay rod.
10. Install the steering shock absorber ball stud nut at the relay rod.

Tighten

Tighten the steering shock absorber ball stud nut to 63 N.m (46 lb ft).

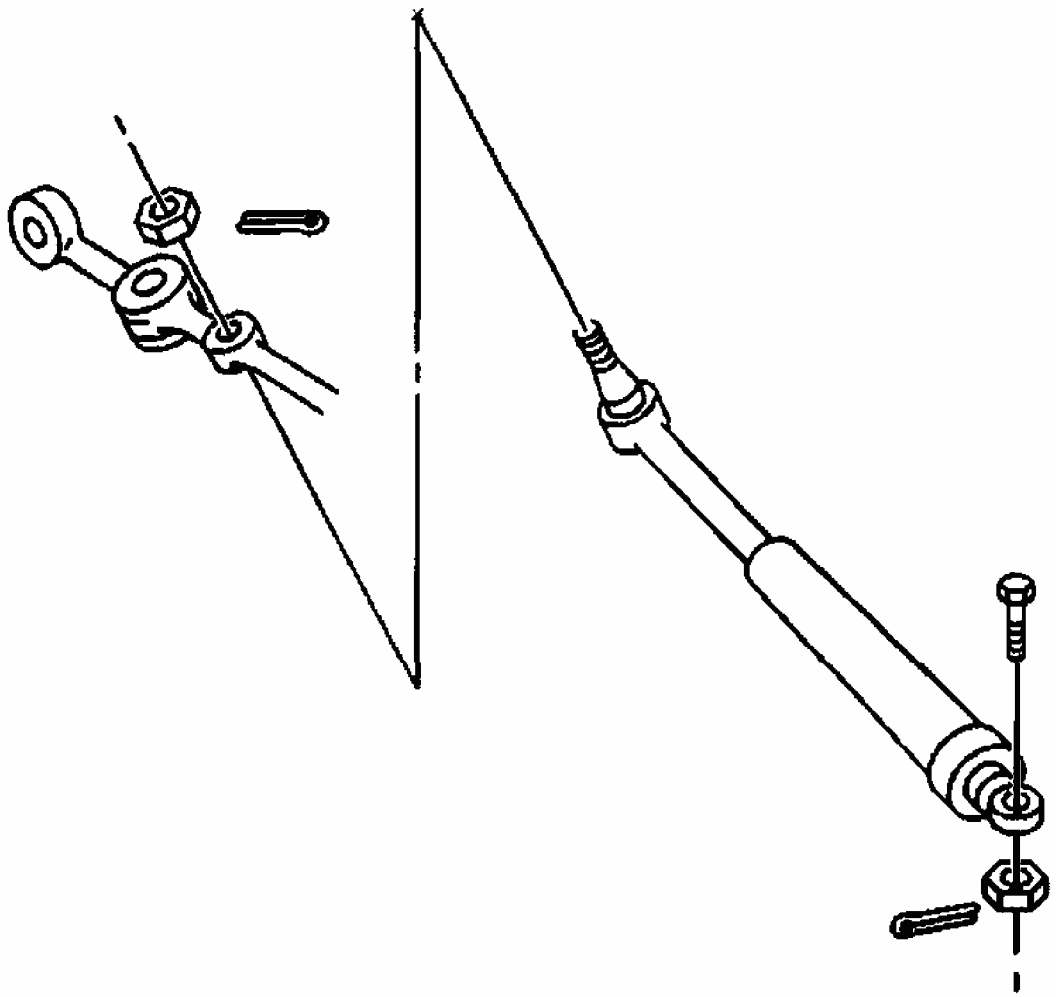

Fig. 54: Connecting Steering Shock Absorber To Relay Rod
Courtesy of GENERAL MOTORS CORP.

11. Install the inner tie rod ball studs to the relay rod. Ensure the seal is on the stud.

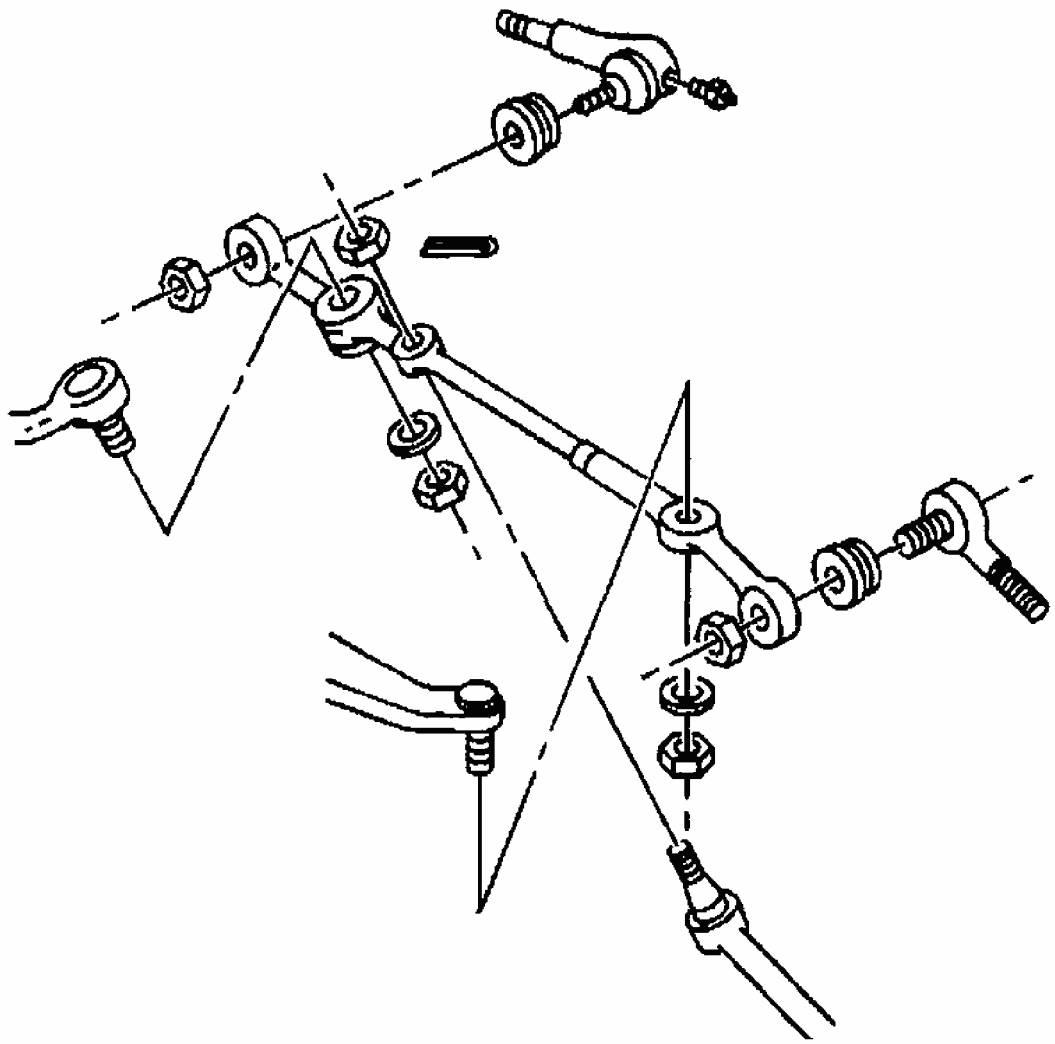

Fig. 55: Installing Inner Tie Rod Ball Studs To Relay Rod
Courtesy of GENERAL MOTORS CORP.

12. Seat the tapers using *J 29193* or *J 29194*.

    Tighten

    Tighten *J 29193* or *J 29194* to 54 N.m (40 lb ft).

13. Remove *J 29193* or *J 29194* from inner tie rod ball stud.
14. Repeat steps 12 and 13 for the opposite side.
15. Install the new nuts to the inner tie rod ball studs at the relay rod.

Tighten

Tighten the inner tie rod ball stud nuts to 47 N.m (35 lb ft).

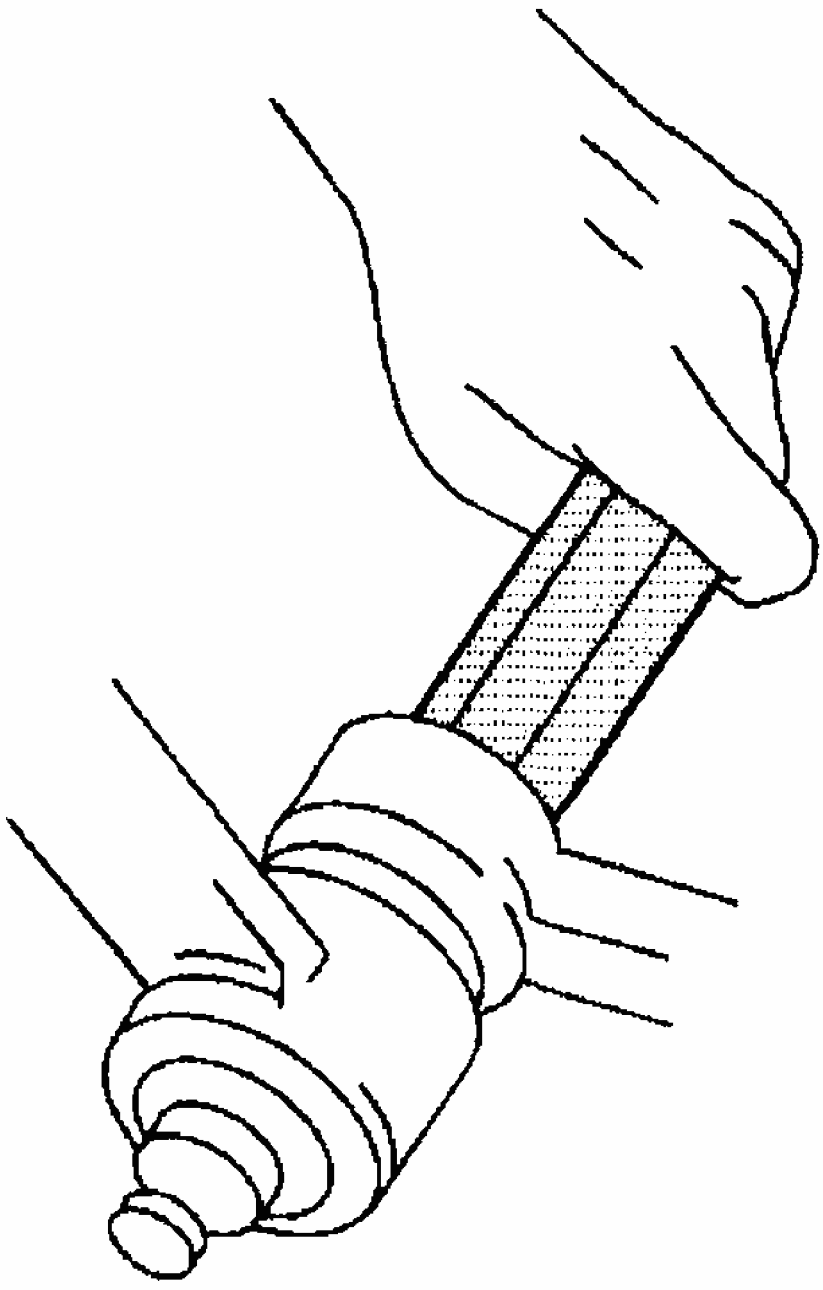

Fig. 56: Tightening Inner Tie Rod Ball Stud Nuts
Courtesy of GENERAL MOTORS CORP.

16. Install the differential carrier shield.
17. Install the differential carrier shield mounting bolts.

    Tighten

    Tighten the differential carrier shield mounting bolts to 25 N.m (19 lb ft).

18. Install the steering linkage shield. Refer to **STEERING LINKAGE SHIELD REPLACEMENT** .
19. Lower the vehicle.
20. Adjust the front toe. Refer to **FRONT TOE ADJUSTMENT** in Wheel Alignment.

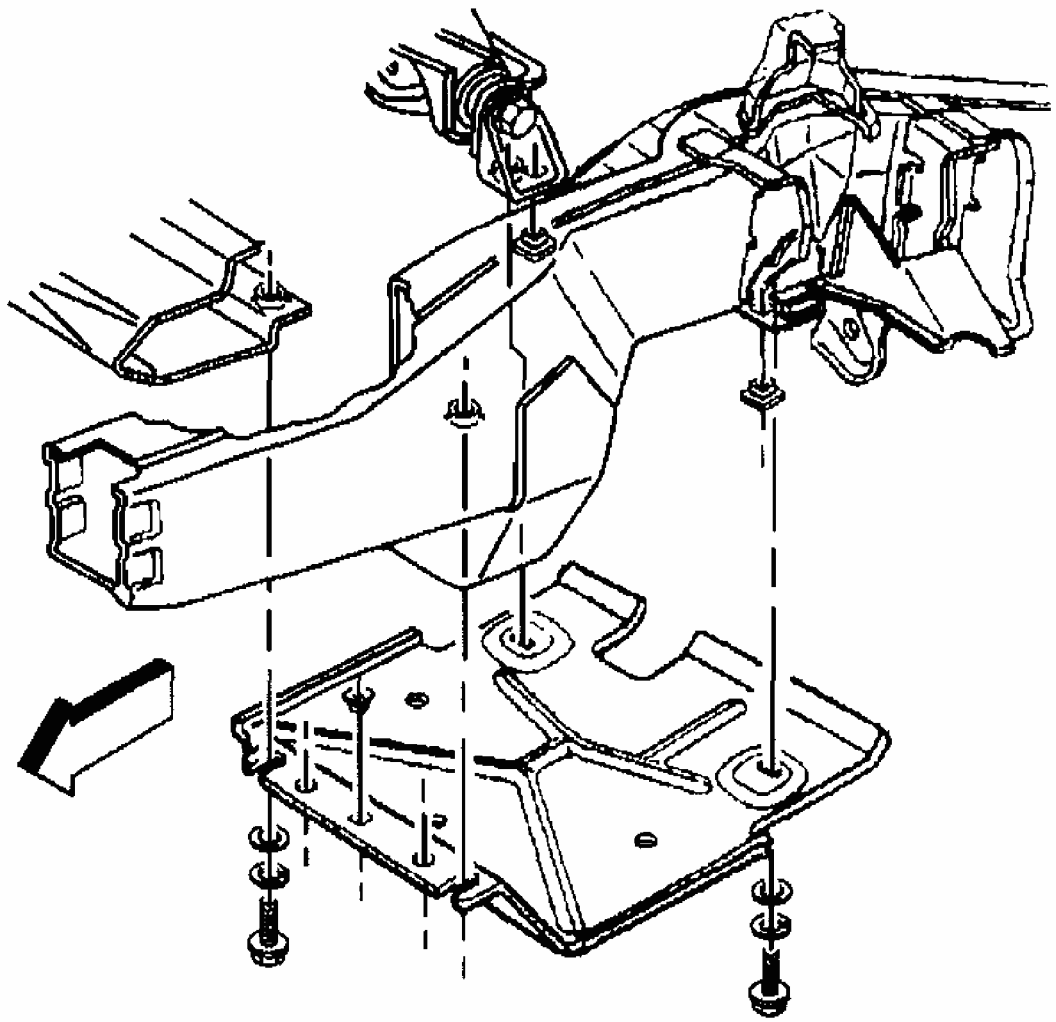

Fig. 57: Differential Carrier Shield Mounting Bolts

Courtesy of GENERAL MOTORS CORP.

STEERING DAMPER REPLACEMENT

Tools Required

- *J24319-B* Steering Linkage and Tie Rod Puller
- *J 29193* Steering Linkage Installer (12 mm)
- *J 29194* Steering Linkage Installer (14 mm)

Removal Procedure

1. Raise and suitably support the vehicle. Refer to **LIFTING AND JACKING THE VEHICLE** in General Information.
2. Remove the steering linkage shield. Refer to **STEERING LINKAGE SHIELD REPLACEMENT** .
3. Remove the differential carrier shield mounting bolts.
4. Remove the differential carrier shield.

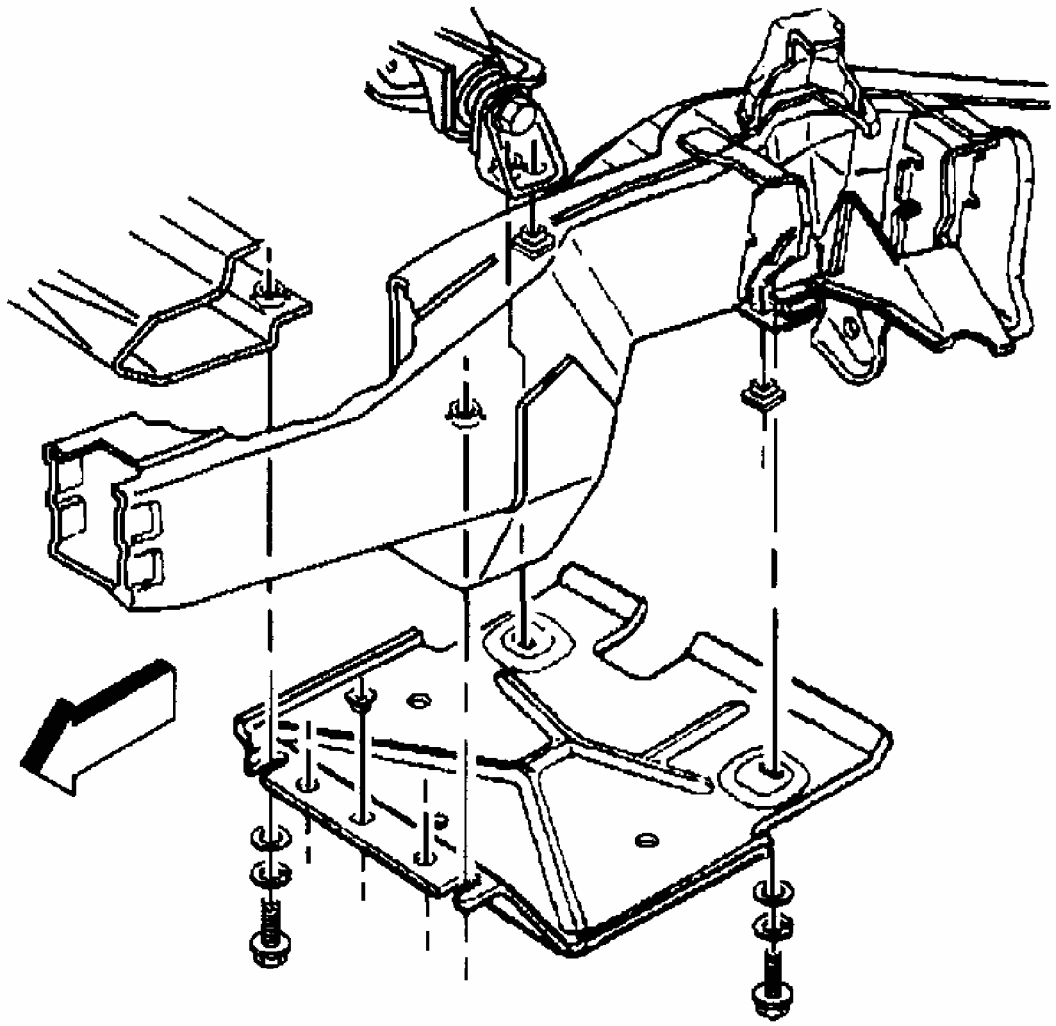

Fig. 58: Differential Carrier Shield Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

Important: Use the proper tool in order to separate all ball joints.

5. Remove the cotter pin from the steering shock absorber ball stud nut.
6. Remove the steering shock absorber ball stud nut.

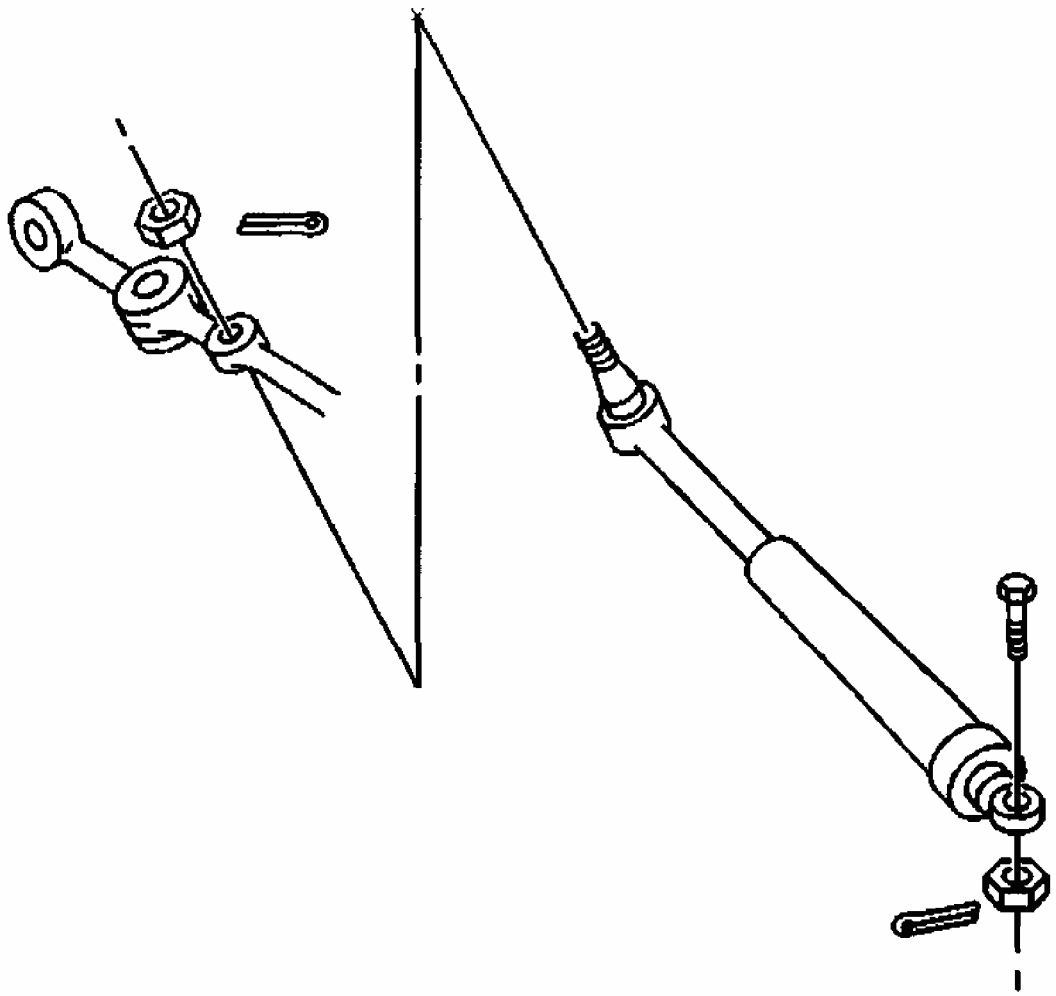

Fig. 59: Removing Cotter Pin From Steering Shock Absorber Ball Stud Nut
Courtesy of GENERAL MOTORS CORP.

7. Remove the steering shock absorber from the relay rod using *J24319-B*.

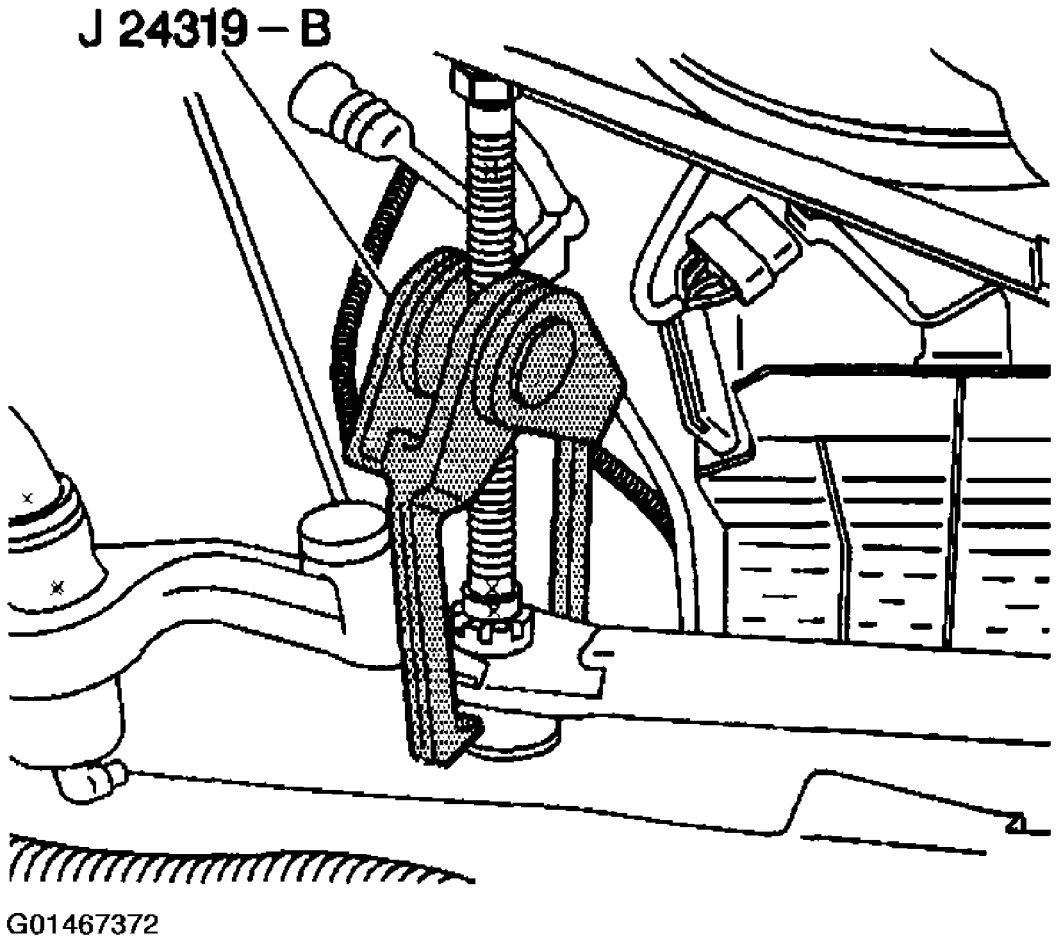

Fig. 60: Removing Steering Shock Absorber From Relay Rod
Courtesy of GENERAL MOTORS CORP.

8. Remove the steering shock absorber mounting bolt at the front crossmember bracket nut.
9. Remove the steering shock absorber mounting bolt from the front crossmember bracket.
10. Remove the steering shock absorber.
11. Inspect the ball stud threads for damage.
12. Inspect the ball stud seals for excessive wear.
13. Clean the threads in the ball stud and the ball stud nut.

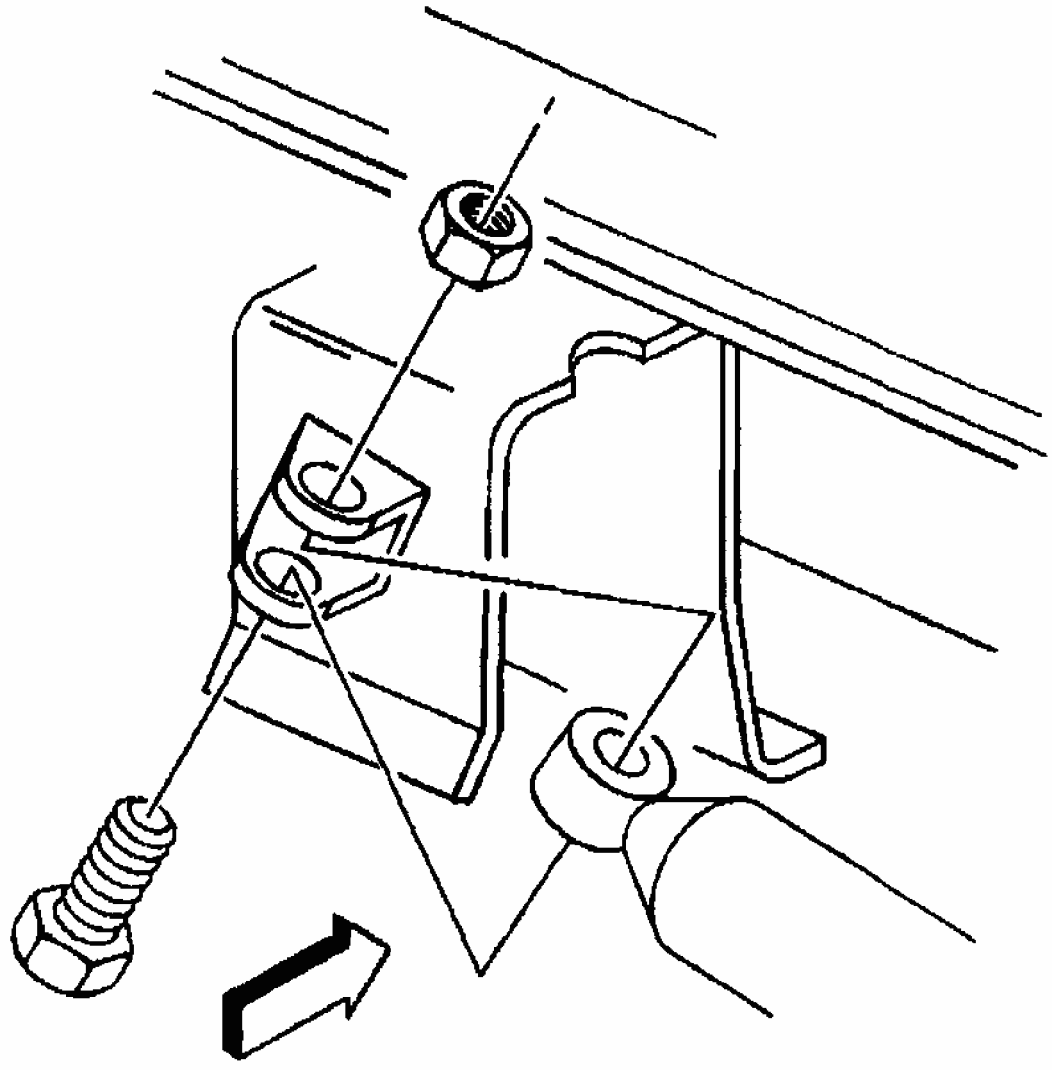

Fig. 61: Removing Steering Shock Absorber Mounting Bolt From Front Crossmember Bracket
Courtesy of GENERAL MOTORS CORP.

Installation Procedure

1. Install the steering shock absorber mounting bolt to the front crossmember bracket.

NOTE: Refer to FASTENER NOTICE in Cautions and Notices.

2. Install the steering shock absorber mounting bolt to the front crossmember bracket nut.

Tighten

Tighten the steering shock absorber mounting bolt to the front crossmember bracket nut to 60 N.m (44 lb ft).

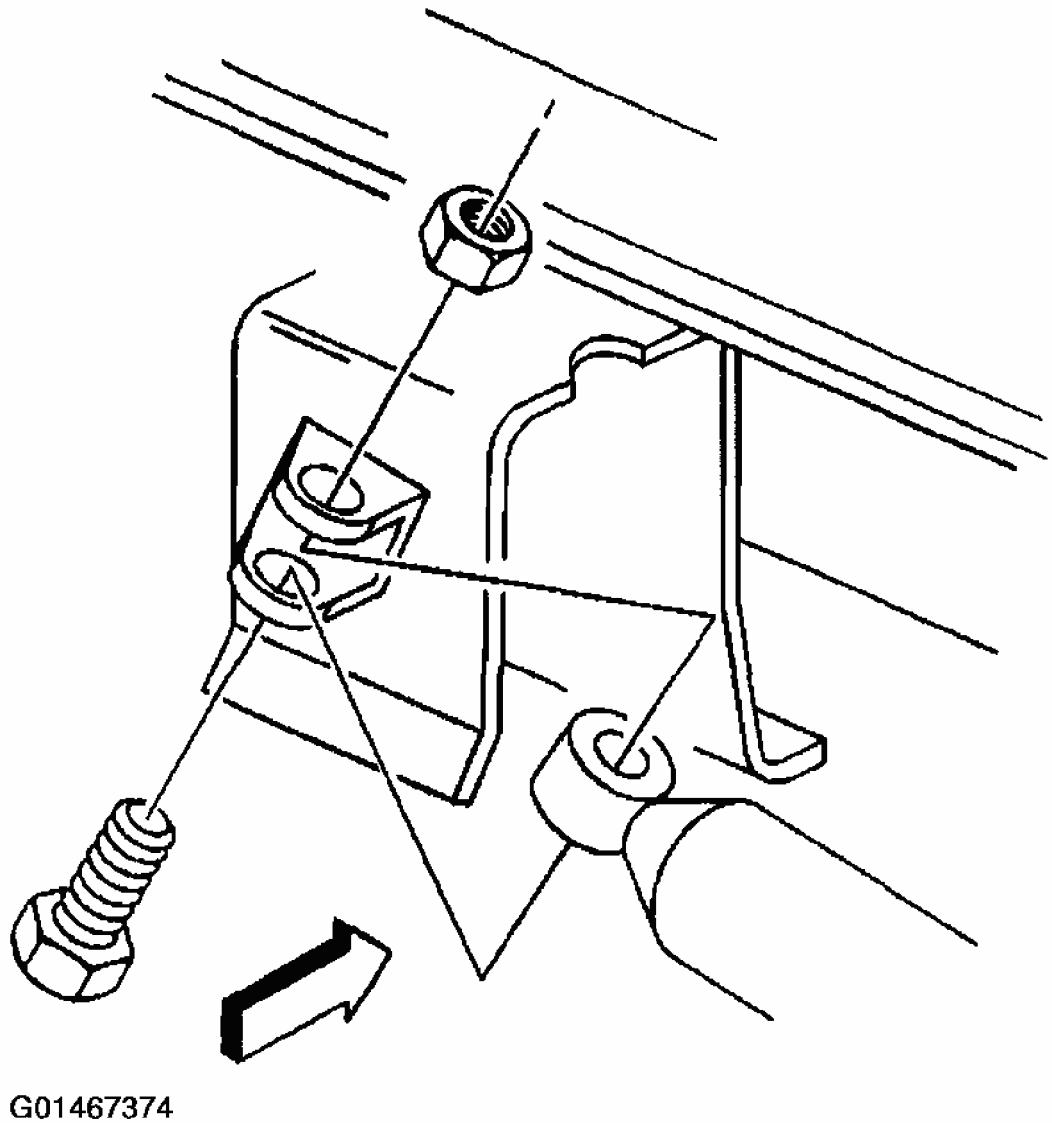

Fig. 62: Installing Steering Shock Absorber Mounting Bolt To Front Crossmember Bracket Nut
Courtesy of GENERAL MOTORS CORP.

3. Install the new cotter pin to the steering shock absorber mounting bolt to the frame bracket nut. Bend out the ends of the cotter pin.
4. Install the steering shock absorber ball stud to the relay rod.

   Ensure that the seal is on the stud.

5. Seat the taper using *J 29193* or *J 29194* .

   Tighten

   Tighten *J 29193* or *J 29194* to 54 N.m (40 lb ft).

6. Remove *J 29193* or *J 29194* from the steering shock absorber ball stud.
7. Install the steering shock absorber ball stud nut.

   Tighten

   Tighten the steering shock absorber ball stud nut to 63 N.m (46 lb ft).

8. Install the new cotter pin to the steering shock absorber ball stud nut.

   Bend out the ends of the cotter pin.

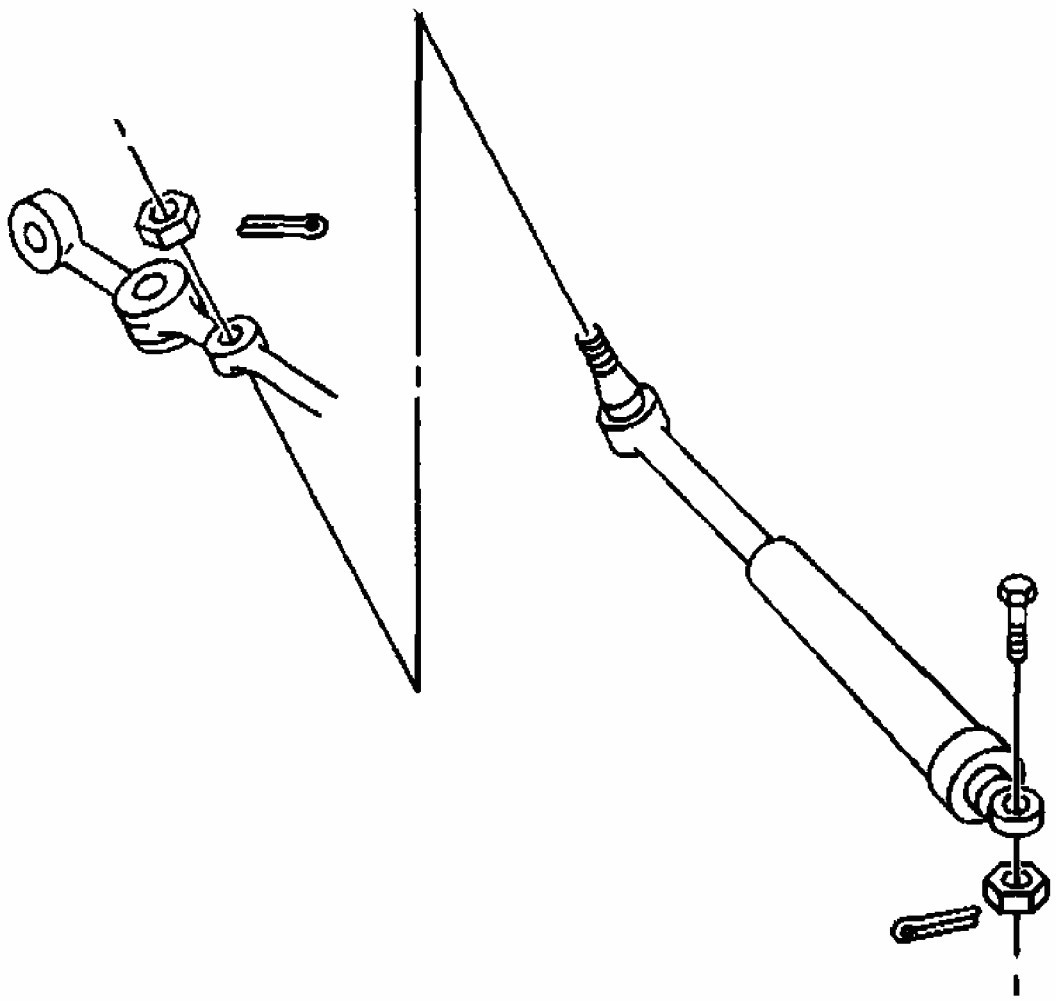

Fig. 63: Installing Steering Shock Absorber Ball Stud To Relay Rod
Courtesy of GENERAL MOTORS CORP.

9. Install the differential carrier shield.
10. Install the differential carrier shield mounting bolts.

Tighten

Tighten the differential carrier shield mounting bolts to 25 N.m (19 lb ft).

11. Install the steering linkage shield. Refer to - **STEERING LINKAGE SHIELD REPLACEMENT** .
12. Lower the vehicle.

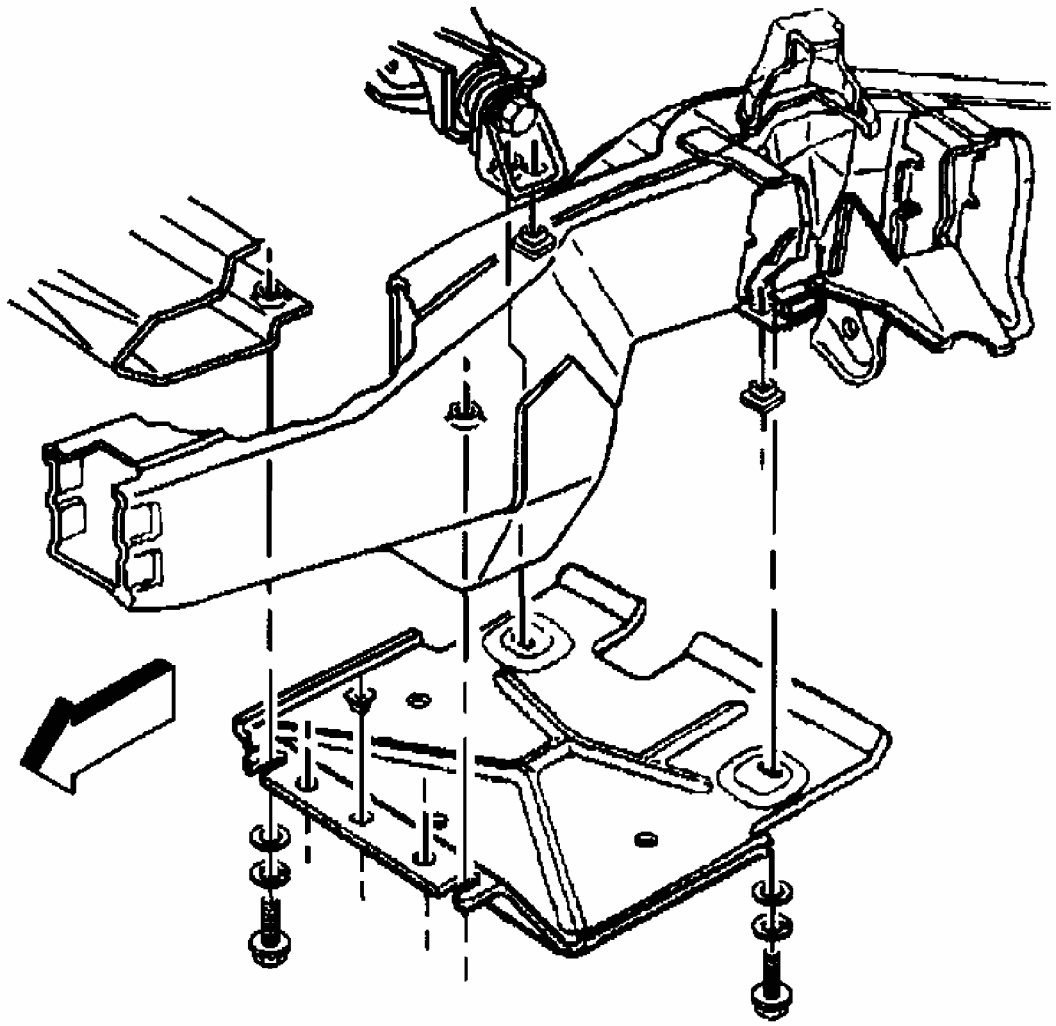

Fig. 64: Steering Linkage Shield
Courtesy of GENERAL MOTORS CORP.

PITMAN ARM REPLACEMENT (RWD)

Tools Required

- *J 24319-B* Steering Linkage and Tie Rod Puller
- *J 29107-A* Pitman Arm Puller
- *J 6632-01* Pitman Arm Remover
- *J 29193* Steering Linkage Installer (12 mm)
- *J 29194* Steering Linkage Installer (14 mm)

Removal Procedure

1. Raise and suitably support the vehicle. Refer to **LIFTING AND JACKING THE VEHICLE** in General Information.

   Important: Use the proper tool in order to remove the relay ball stud nut.

2. Remove the relay rod ball stud at the pitman arm.

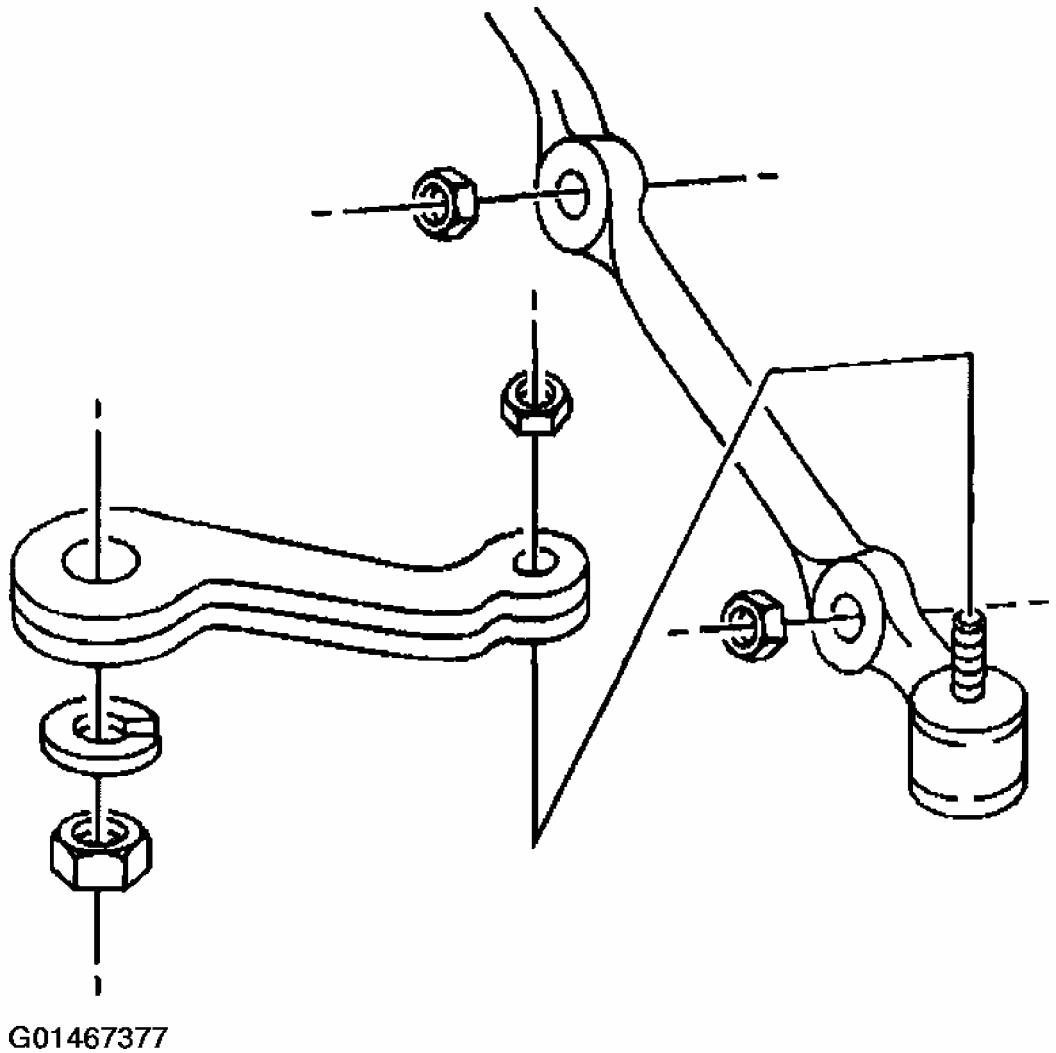

Fig. 65: Removing Relay Rod Ball Stud At Pitman Arm
Courtesy of GENERAL MOTORS CORP.

3. Remove the relay rod ball stud from the pitman arm using *J 24319-B*.

NOTE: **Do not hammer on the pitman arm, pitman arm shaft or puller. Damage to the pitman arm or steering gear may result.**

4. Remove the pitman arm nut and washer from the steering gear.

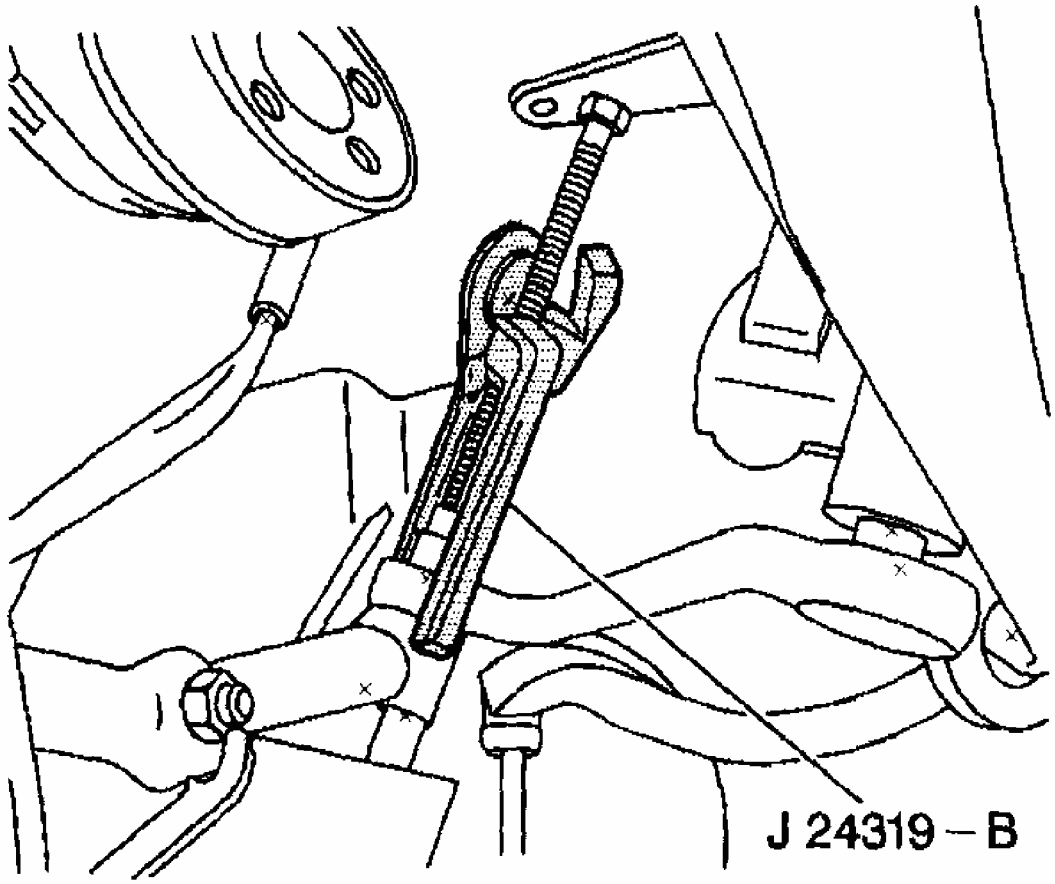

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Fig. 66: Removing Relay Rod Ball Stud From Pitman Arm
Courtesy of GENERAL MOTORS CORP.

5. Remove the pitman arm from steering gear using *J 6632-01* or *J29107-A*.
6. Inspect the ball stud threads for damage.
7. Inspect the ball stud seals for excessive wear.
8. Clean the threads on the ball stud and the ball stud nut.

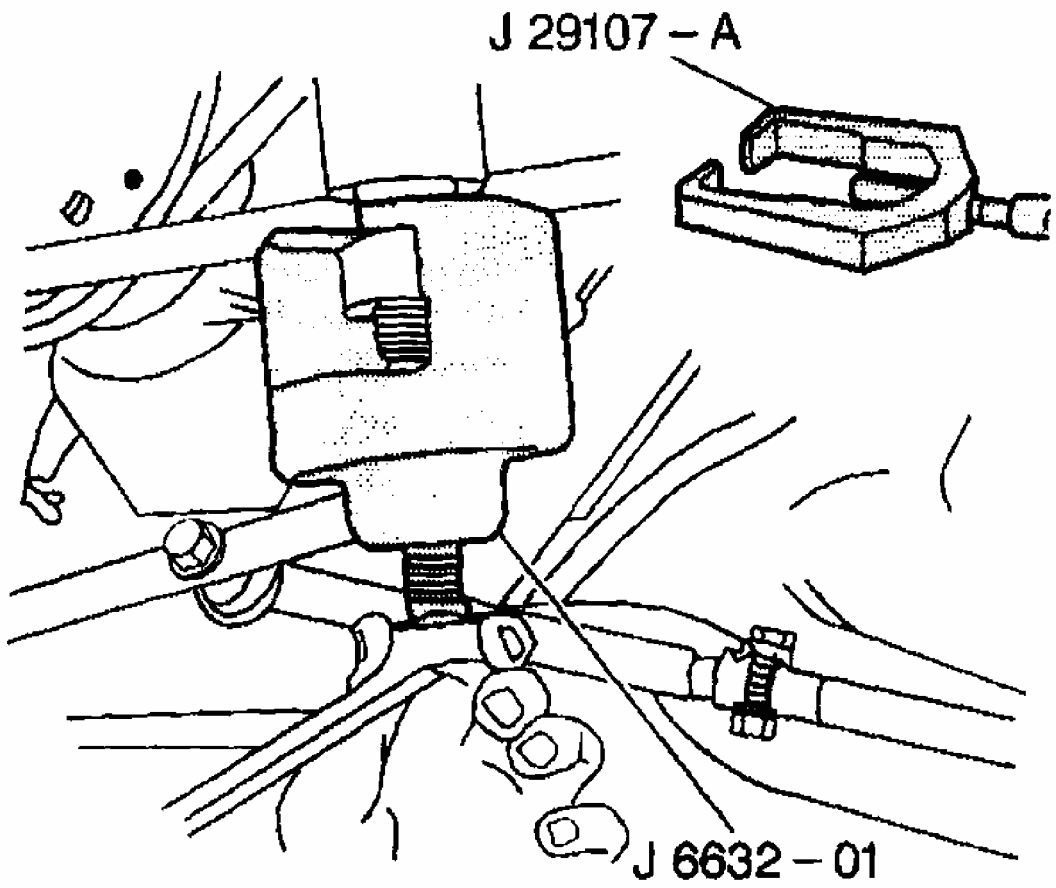


Fig. 67: Removing Pitman Arm From Steering Gear
Courtesy of GENERAL MOTORS CORP.

Installation Procedure

1. Install the pitman arm to the pitman arm shaft.

   NOTE: Refer to FASTENER NOTICE in Cautions and Notices.

2. Install the pitman arm washer and nut to the pitman arm shaft.

   Tighten

   Tighten the pitman arm shaft nut to 250 N.m (185 lb ft).

3. Install the relay rod ball stud to the pitman arm. Ensure the seal is on the stud.

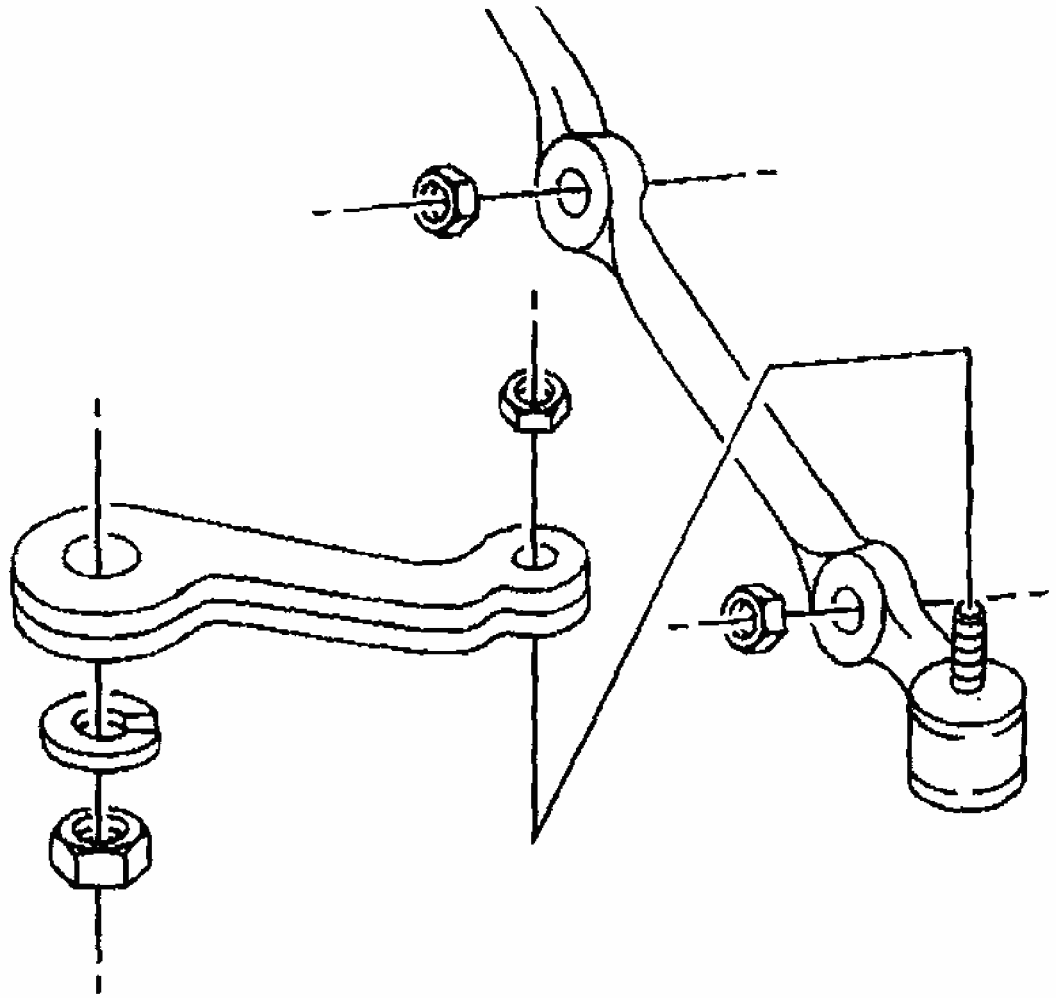


Fig. 68: Installing Pitman Arm Washer & Nut To Pitman Arm Shaft
Courtesy of GENERAL MOTORS CORP.

4. Seat the taper using *J 29193* or *J 29194* .

   Tighten

   Tighten *J 29193* or *J 29194* to 62 N.m (48 lb ft).

5. Remove *J 29193* or *J 29194* from the relay rod ball stud.
6. Install the new nut to the relay rod ball stud.

   Tighten

   Tighten the relay rod ball stud nut to 83 N.m (61 lb ft).

7. Lower the vehicle.

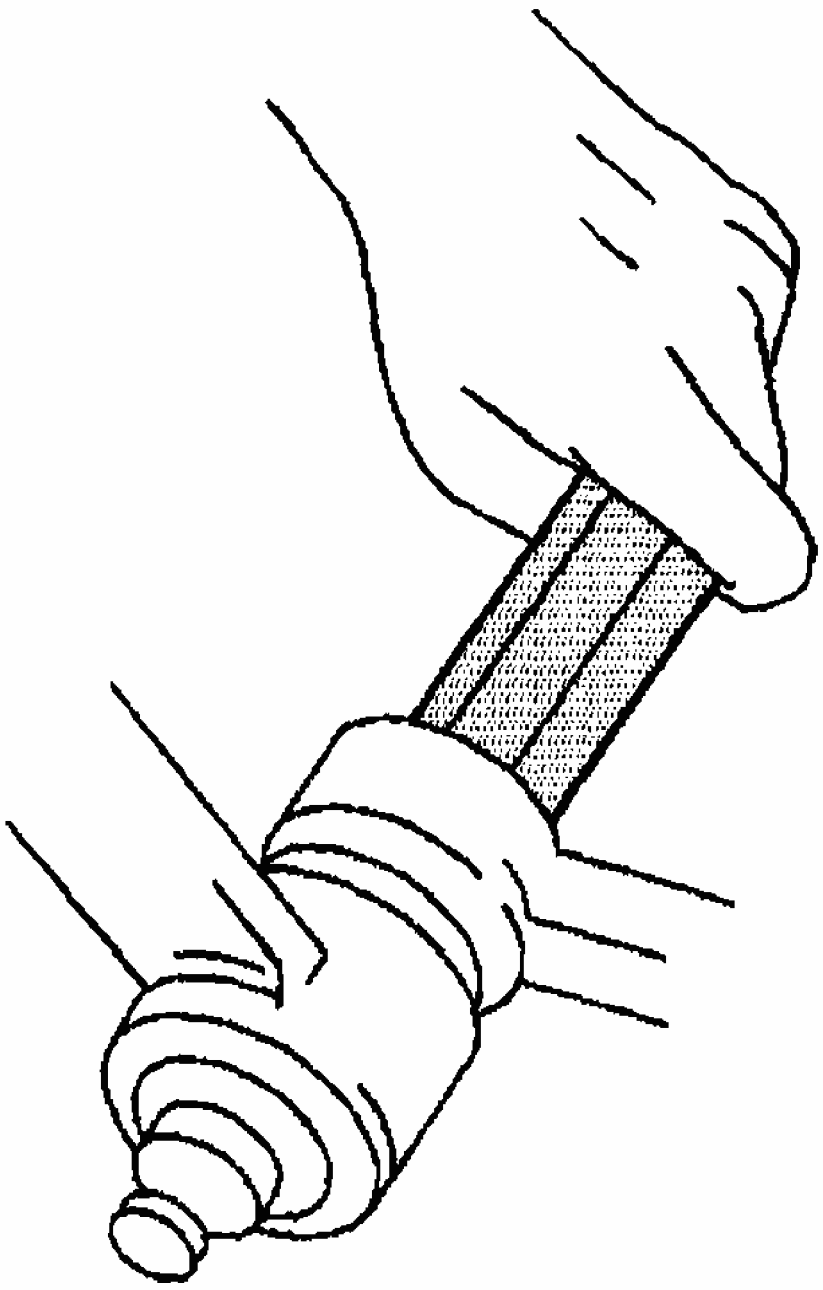


Fig. 69: Tightening Relay Rod Ball Stud Nut
Courtesy of GENERAL MOTORS CORP.

PITMAN ARM REPLACEMENT (4WD)

Tools Required

- *J29107-A* Pitman Arm Puller
- *J 6632-01* Pitman Arm Puller

Removal Procedure

1. Remove the power steering gear. Refer to **POWER STEERING GEAR REPLACEMENT (RWD)** or **POWER STEERING GEAR REPLACEMENT (4WD)** in Power Steering System.
2. Install power steering gear into vise.
3. Remove the pitman arm nut and washer from the pitman arm shaft.

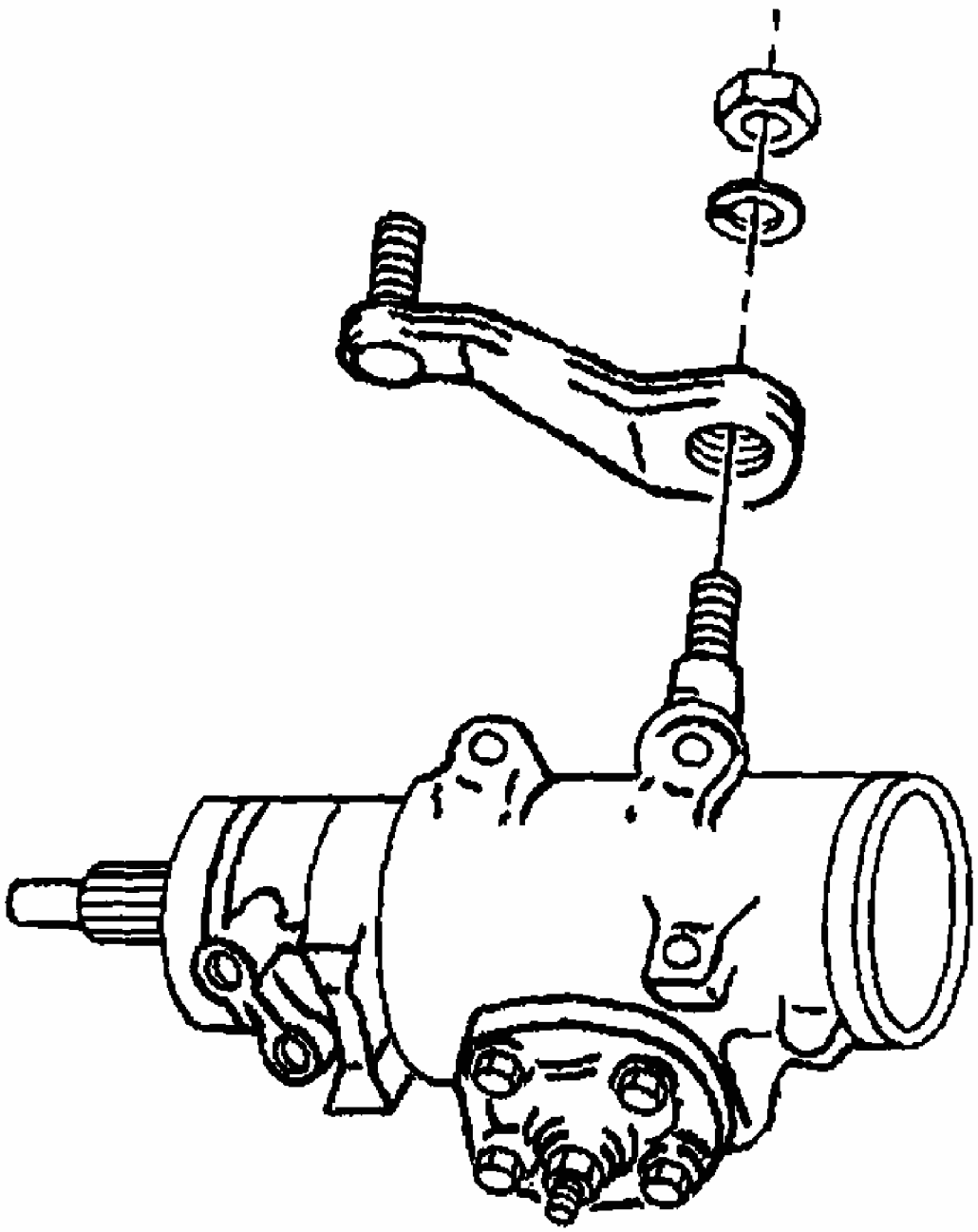


Fig. 70: Removing Pitman Arm Nut & Washer From Pitman Arm Shaft
Courtesy of GENERAL MOTORS CORP.

NOTE: Do not hammer on the pitman arm, pitman arm shaft or puller. Damage to the pitman arm or steering gear may result.

4. Disconnect the pitman arm from the pitman shaft using *J 6632-01* or *J29107-A*.
5. Inspect the following items:
   - The ball stud threads for damage
   - The ball stud seals for excessive wear
6. Clean the threads on the ball stud.

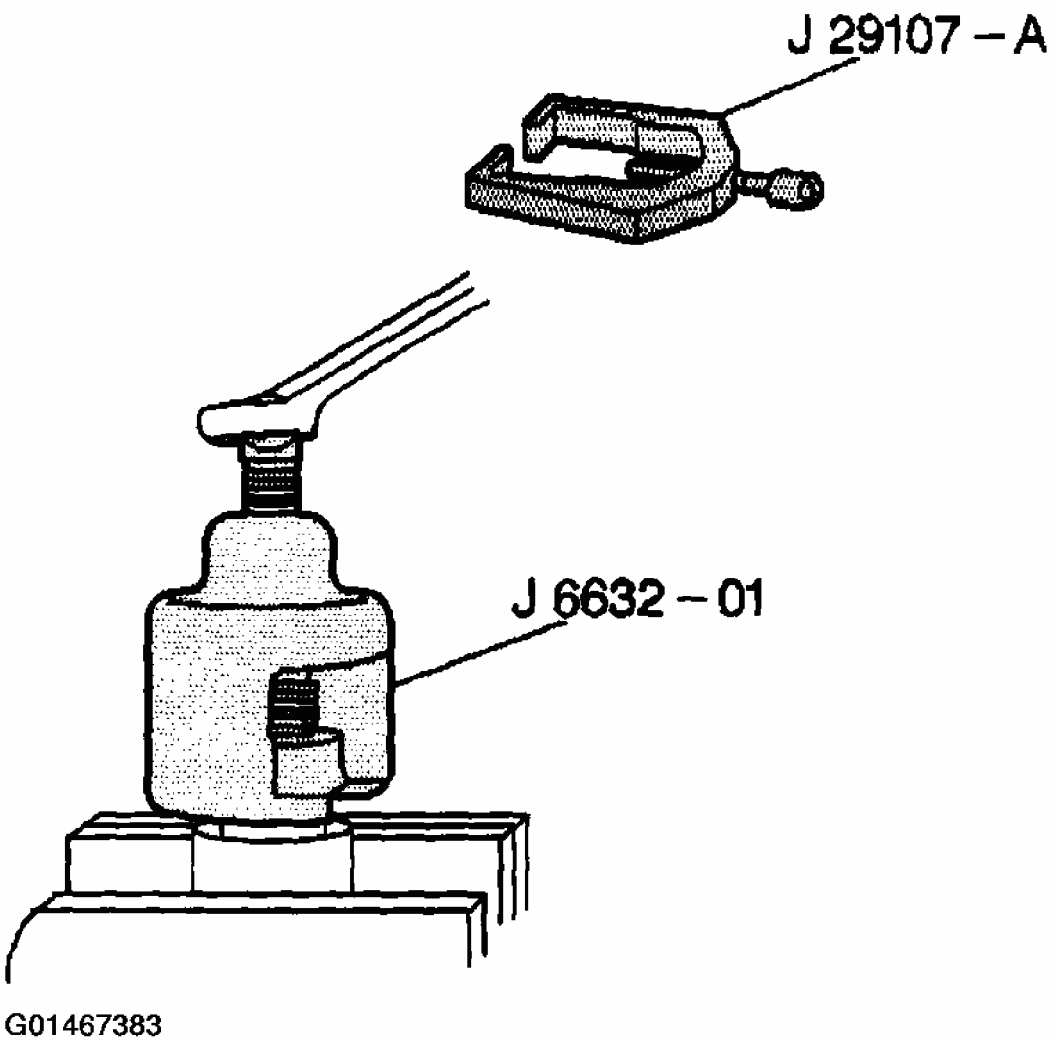


Fig. 71: Disconnecting Pitman Arm From Pitman Shaft
Courtesy of GENERAL MOTORS CORP.

Installation Procedure

1. Install the pitman arm to the pitman arm shaft.

NOTE: Refer to FASTENER NOTICE in Cautions and Notices.

2. Install the pitman arm washer and nut to the pitman arm shaft.

   Tighten

   Tighten the pitman arm nut to 250 N.m (185 lb ft).

3. Remove power steering gear from the vise.
4. Install the power steering gear. Refer to **POWER STEERING GEAR REPLACEMENT (RWD)** or **POWER STEERING GEAR REPLACEMENT (4WD)** in Power Steering System.

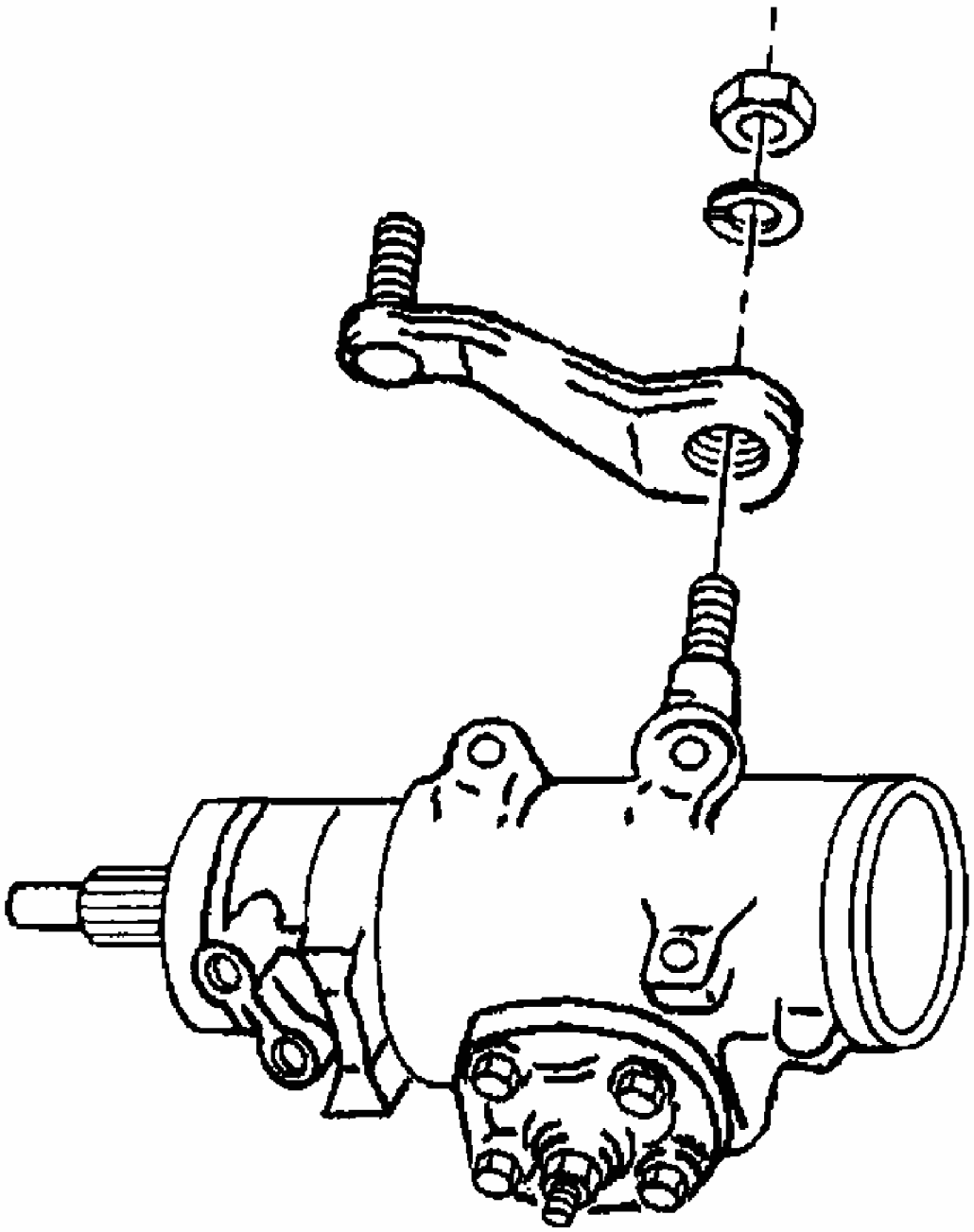


Fig. 72: Installing Pitman Arm Washer & Nut To Pitman Arm Shaft
Courtesy of GENERAL MOTORS CORP.

DESCRIPTION AND OPERATION

STEERING LINKAGE DESCRIPTION

The steering linkage consists of the following components:

- A pitman arm
- An idler arm
- A relay rod
- 2 adjustable tie rods

When you turn the steering wheel, the steering gear rotates the pitman arm which forces the relay rod to one side. The tie rods connect to the relay rod with the ball studs. The tie rods transfer the steering force to the wheels. Use the tie rods in toe adjustments. The tie rods are adjustable. The pitman arm support the relay rod. The idler arm pivots on a support attached to the frame rail and the ball stud attaches to the relay rod.

The 2 tie rod are threaded into the tube and secured with jam nuts. Right and left hand threads are used in order to permit the adjustment of toe.

SPECIAL TOOLS AND EQUIPMENT

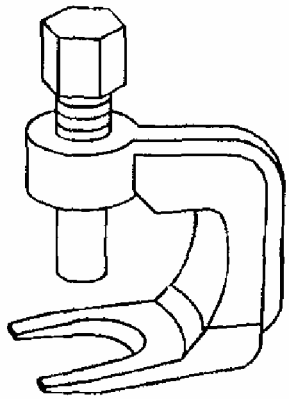
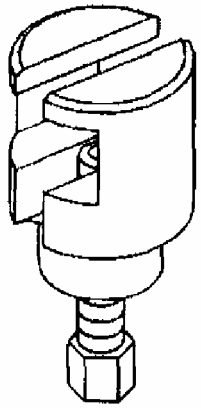
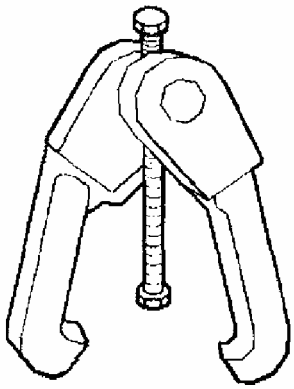
Illustration	Tool Number/Description
	J 6627-A Tie Rod Puller
	J 6632-01 Pitman Arm Puller
	J 24319-B Steering Linkage and Tie Rod Puller

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Fig. 73: Special Tools & Equipment Chart (1 Of 2)
Courtesy of GENERAL MOTORS CORP.

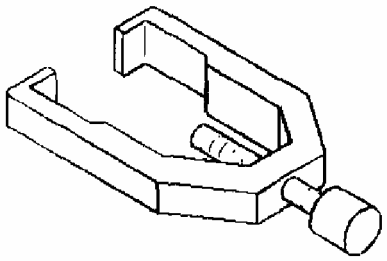
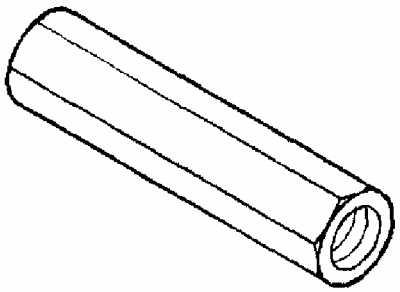
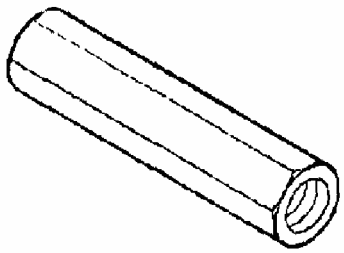
Illustration	Tool Number/Description
	J 29107-A Pitman Arm Puller
	J 29193 Steering Linkage Installer (12 mm)
	J 29194 Steering Linkage Installer (14 mm)

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Fig. 74: Special Tools & Equipment Chart (2 Of 2)
Courtesy of GENERAL MOTORS CORP.